**National Institute of Electronics and Information Technology**

**Name of the Course:** IT A Level

**Course Code:** LTC-3

**Duration of the Course:** 1 Year (Semester System).

**Yearly Session**: January to June session, July to December session**.**

**Fees:**  28250/- (Including Registration Fees, Course fees, Examination fees, Caution Money) which is inclusive of the present Service Tax. *Note- Registration Fees, Course fees, Examination fees is free for SC/ST candidates.*

**Eligibility Criteria and pre-requisites:**

O level Qualifiers OR Any Graduates OR a Govt. recognized Polytechnic Engineering Diploma after class X /XII (No Concurrency).

# CONTENTS

1.      **ABOUT THE REVISED SYLLABUS**

The third revised version of DOEACC syllabus came into effect in July 2003 examinations.  There have been many advancements in Information Technology and consequent changes in needs of the industry in respect of which the syllabus was required to be updated.

This document presents the fourth revised version of DOEACC syllabus which becomes effective for teaching with immediate effect.  This 'A' Level syllabus is designed to facilitate students in the development of concept based approach for problem solving using IT as a tool.  The self learning approach is built into the syllabus, thereby training the candidates to update themselves on the changing technologies in their area of work. The 'A' Level syllabus has been designed to produce Programmers, Web Administrators, Training faculty, Web Content Developers and trouble shooters etc., equipped with latest knowledge and skills.

2.      **DOEACC SOCIETY**

DOEACC Society is an autonomous scientific society of the Department of Information Technology, Ministry of Communications & Information Technology, Govt. of India.  The Society is registered under the Societies Registration Act, 1860. DOEACC Society is the only professional examination body in India, which accredits institutes / organizations for conducting particular course, specializing in the non-formal sector of IT education.

The office of the Society is situated at  Electronics Niketan, 6, CGO Complex, New Delhi – 110 003 and number of counseling centres are situated in important cities in the country.

DOEACC is envisioned to be a premier knowledge institution pursuing human resource development activities in areas of Information Technology, Electronics and Communication Technology (IECT).

DOEACC's holistic quality policy entails offering its courses through painstakingly screened accredited institutes to ensure seriousness at both the institute and individual level.  The Society has its twelve centers at 20 locations namely Agartala, Aizawl, Aurangabad, Calicut (with Southern Regional Office at Pudukkotai, Tamilnadu), Gorakhpur (with eastern Regional Office at Patna, Bihar), Imphal, Kohima/Chuchuyamlang, Kolkata, Srinagar/Jammu, Shillong, Tezpur/Guwahati, Chandigarh (Branches at New Delhi, Shimla, Lucknow). Two more DOEACC Centres at Chennai, Tamilnadu and Gangtok, Sikkim are being setup. These Centres provide quality education & training programmes in Information, Electronic Design and related technologies/areas on long term and short term basis.

3.      **DOEACC SCHEME**

DOEACC is a joint Scheme of the Ministry of Communications & Information Technology, Department of Information Technology (erstwhile Department of Electronics) and All India Council for Technical Education (AICTE), Govt. of India.

**Objective of the Scheme**

The objective of the Scheme is to generate qualified manpower in the area of Information Technology (IT) at the national level, by utilizing the facilities and infrastructure available with the institutions/organizations in the non-formal sector.

The Society is managed and administered by a Governing Council which consists of eminent academicians and professionals from IT industry. Minister for Communications & Information Technology, Govt. of India, is the Chairman of the Governing Council of the Society. The Executive Director is the Chief Executive Officer of the Society and manages day to day affairs of the Society. Manifold functions of the DOEACC Scheme are:

a) Accreditation
b) Registration and
c) Examination

## 4. DOEACC 'A' LEVEL COURSE

**Objective of the 'A' Level Course**

An 'A' Level qualifier is expected to be key member of a software development team with all round capabilities to manage and guide a software project. In order to develop these capabilities the 'A' level course has been so designed that a student acquires an in-depth knowledge of the key areas like the computer software, office automation products ,knowledge of developing a business system module using database packages, problem solving skills using programming languages, computer architecture, software development life cycle, data-structure, database management system, operating system, practical exposure to UNIX/LINUX and communication principles and computer networking, object oriented programming using C++/ Java, and multimedia application.

The career options available to a DOEACC 'A' level qualifiers are:

- Programmer
- Web Administrator
- Training faculty
- Web Content Developer
- Trouble Shooter

DOEACC 'A' Level Course consists of ten theory modules (nine compulsory modules and one elective module), two Practicals and one Project. The structure of the 'A' Level syllabus is indicated below:-

**DOEACC 'A' LEVEL COURSE STRUCTURE**

**The structure of  the 'A' Level course is:**

| Paper Code | Subject |
|---|---|
| A1-R4 | IT Tools and Business System |
| A2-R4 | Internet Technology and Web Design |
| A3-R4 | Programming and Problem Solving Through 'C' Language |
| A4-R4 | Computer System Architecture |
| A5-R4 | Structured System Analysis and Design |

| A6-R4 | Data Structures through 'C++' |
| A7-R4 | Introduction to Database Management System |
| A8-R4 | Basics of Os, Unix and Shell Programming |
| A9-R4 | Data Communication and Network Technologies |
| A10-R4 | Elective (One out of the following two subjects to be chosen) |
| A10.1-R4 | Introduction to Object-Oriented Programming through Java. |
| A10.2-R4 | Software Testing and Quality Management |
| PR-1 | Practical -1(Based on A1, A2, A3, A4 module syllabus) |
| PR-2 | Practical -2 (based on A5,A6,A7,A8,A9,A10 modules syllabus) |
| PJ | Project |

## 5.    PRACTICAL

All 'O', 'A' and 'B' Level Candidates under the revised syllabi (Revision 4) shall have to qualify the Practical Examination, in addition to qualifying the theory examinations as well as the Project Work.

The students have to devote half of the total time allotted to each module for  the practical session.  Practical assignments have been worked out  for each theory paper. At 'A' Level, there are two Practical Examinations. The Practical-1 examination will be based on the syllabi A1-R4, A2-R4, A3-R4 and A4-R4 modules and Practical -2 will be based on the syllabi A5-R4, A6-R4, A7-R4, A8-R4, A9-R4 and A10-R4 modules of the 'A' Level course.

## 6.    PROJECT

DOEACC curriculum has a project as an important component of 'A' Level course. The Project is carried out by the student under guidance and support of faculty and management of the respective institute.  It is felt that such a project provides an opportunity to the student to apply his/her knowledge and skills to real life problems (including oral and written communication skills), and as such the project should be given utmost importance and priority both by the students as well as institution faculty / management in respect of its identification, planning and implementation.

### Objective of the Project

The aim of the project is to give the students an integrated experience in solving a real life problem by applying knowledge and skills gained on completion of theory papers in a course at a given Level.  It provides an occasion for students to develop written and communication skills, Project also helps the students to realize the importance of resource and time management, ownership of task towards deliverables, innovation and efficiency in task management apart from presentation skills.  It also provides a good opportunity for students to build, enhance and sustain high levels of professional conduct and performance and evolves a problem solver frame of mind in student.  It is also felt that taking up the project by a student prepares him for a job in industry and elsewhere.

### Who could be a Supervisor / Guide

A guide for 'A' Level should be a person with DOEACC 'B' level/MCA/B.Tech/ equivalent/higher qualification and adequate experience (minimum 3 years) in the area in which the student has chosen the Project.  In the case of a candidate from an

accredited institute, the institute concerned will render all help including the nomination of the Supervisor.

**Time of Submission of 'A' Level Project**

A Level student can submit the project only after clearing 5 papers of the 'A' Level Course.
A level: Projects would be approximately 350 man-hours and carries a total of 100 marks (80% for the project evaluation and 20% for the viva-voce).

**Some important notes while preparing the project proposal**

The following suggested guidelines may be followed in preparing the Final Project Report:

Good quality white executive bond paper A4 size should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.
Page Specification: (Written paper and source code)
Left margin          3.0 cms
Right margin         3.0 cms
Top margin           2.7 cms
Bottom margin        2.7 cms
Page numbers – All text pages as well as Program source code listing should be numbered at the bottom center of the pages.

**Submission of Project Report to DOEACC**

The student will submit his/her project report in the prescribed format along with requisite fee. The Project Report should include:
  • One hard copy of the Project Report.
  • Soft copy of Project on Floppy / CD
  • The Project Report may be about 50 pages (excluding coding).

**FEES:**

A Level: A fee of **Rs.500/- (Rupees Five Hundred only)** should be remitted to DOEACC Society by a demand draft in favor of DOEACC payable at New Delhi.

7.    **CREDIT SCHEME FOR DOEACC 'A' LEVEL COURSE**

**Introduction**

A credit system based on the AICTE norms has been introduced for indicating the efforts required to pass a specific level of course under the DOEACC Scheme. Award of credit to a student will facilitate measurement/comparison of study hours including Theory Lectures, Tutorials and Practical Assignments put in a given mudule/paper/subject under the Scheme with similar course in IT in India and abroad. This will also facilitate other Universities/Apex Accrediting bodies to consider academic and professional equivalence of DOEACC courses. This will also help students/organizations to transfer credits from DOEACC to other academic bodies and vice-versa for ensuring continuing education. Following table gives the

no. of hours of Lectures/Tutorials and Practicals per week to be attended and the credits earned by the student:-

**Calculation of Credits**

**'A' Level**

| | Subject | L* | T/P** | No. of Credits+ |
|---|---|---|---|---|
| A1-R4 | IT Tools and Business System | 3 | 3 | 5 |
| A2-R4 | Internet Technology and Web Design | 3 | 3 | 5 |
| A3-R4 | Programming and Problem Solving Through 'C' Language | 3 | 3 | 5 |
| A4-R4 | Computer System Architecture | 3 | 3 | 5 |
| A5-R4 | Structured System Analysis and Design | 3 | 3 | 5 |
| A6-R4 | Data Structures through 'C++' | 3 | 3 | 5 |
| A7-R4 | Introduction to Database Management System | 3 | 3 | 5 |
| A8-R4 | Basics of Os, Unix and Shell Programming | 3 | 3 | 5 |
| A9-R4 | Data Communication and Network Technologies | 3 | 3 | 5 |
| **A10-R4** | **Elective (One out of the following two subjects to be chosen)** | | | |
| A10.1-R4 | Introduction to Object-Oriented Programming through Java | 3 | 3 | 5 |
| A10.2-R4 | Software Testing and Quality Management | 3 | 3 | 5 |
| | Project | 3 | 3 | 5 |
| | Total Credit (for 10 papers) | | | 55 |

*L     :      No. of Lecture hours per week
**T/P  :      No. of Tutorial/Practical hours per week

+Credits = L + (T+P)/2

**Notes**

1.    One credit is defined as one hour of lecture of 2 hrs. of tutorial / practicals every week for one semester consisting of 20 weeks.
2.    Total No. of credits earned in a module is calculated using AICTE FORMULA (as applicable to Under Graduate Courses in IT namely
      C=L + (T+P)/2 where L, T and P indicate no. of hours per week for Lectures, Tutorials and Practicals.
3.    The credit scheme was implemented from July, 2003 examinations.
4.    Fractions in Credits have been rounded to nearest integer.

**8.    EXAMINATION PATTERN**

The theory examination for each module under the fourth revised syllabus would be for duration of three hours and the total marks for each subject would be 100. Two Practical examinations of three hours duration and 100 marks each have been introduced. The first examination with the revised syllabus will be held in July 2010, for which teaching will commence with immediate effect.

Dates for the various activities connected with examinations will be announced on DOEACC website, well in advance of the examinations.

**Pass percentage**

To qualify for a pass in a module, a candidate must have obtained at least 50% in each theory and practical examination. The marks will be translated into grades, while communicating results to the candidates. The gradation structure is as below:-

| Pass percentage | Grade |
|---|---|
| Failed (<50) | F |
| 50%-54% | D |
| 55%-64% | C |
| 65%-74% | B |
| 75%-84% | A |
| 85% and over | S |

**Award of Certificates**

Successful candidates in 'A' Level would be eligible for a certificate which is recognized as equivalent to Advance Diploma in Course by the Government of India for the purpose of employment vide Ministry of Human Resources Development, Govt. of India's notification no. F.18-23/92-TD.V/TS dated 1$^{st}$ March, 1995 and F.18-23/92-TD.V/TS-IV dated 10$^{th}$ April, 1996.

**Registration**

Registration is a pre-requisite for appearing in DOEACC examinations. A candidate can register at only one Level at a time to appear for the examination. Registration is only for candidates and not for institutes. Registration forms are available from the DOEACC Society free of cost and also can be downloaded from the website. The eligibility criteria for registration at 'A' Level is as follows:

**Students from Institutes conducting accredited courses:**

Level 'O'/Government recognized polytechnic engineering diploma after class 10. Followed in each case, by an accredited 'A' Level course (no concurrency)

Or

A Government recognized polytechnic engineering diploma after 10+2/ Graduate and an accredited 'A' Level course in each case (may be concurrent). Even after clearing 'A' Level the diploma will be awarded only after successful completion of the academic stream i.e. polytechnic engineering diploma after 10+2 or degree.

**Direct Applicants**

Level 'O'/Government recognized polytechnic engineering diploma/Graduate, followed in each case, by one year relevant experience. Relevant experience connotes job experience in IT, including teaching in a recognized institution as a faculty member, excludes coaching.

For getting registered, a candidate fulfilling the eligibility criteria should apply in the prescribed form with a photograph affixed thereon attested by a gazetted Officer/Panchayat/Bank Officer/ Centre Manager of the institute where the candidate has undergone the accredited course. The Registration application should be submitted along with attested photocopy of the certificate of highest educational qualification attained by the candidate, copy of relevant job experience certificate (in case of direct candidate) and Demand Draft drawn in favour of 'DOEACC society' payable at New Delhi for the prescribed amount of Registration fee. Registration fee once paid is not reimbursable or adjustable against any other payment.

Registration application can be submitted throughout the year, however cut off dates are specified for submitting Registration applications for each examinations for the convenience of processing and allotting Registration Numbers.

| Level | Cut off Dates | |
|---|---|---|
| | January Exams | July Exams |
| A Level | Preceding 31$^{st}$ July | Preceding 31$^{st}$ January |

Accredited Institutes are allowed to submit the Registration Application Form of their candidates one month beyond the cut off dates.

**Auto-upgradation**:

The candidates successfully completing all papers (Theory as well as Practical) of a particular Level in a particular Examination and wish to appear in the next Examination for immediate higher Level are exempted from the above cut off dates. Such candidates can fill up examinations Form and Registration Forms for higher Levels subject to following conditions:-

a) Registration fee is not mixed/combined with Examination fee and is paid through a separate Demand Draft.

b) The facility is available to the candidates appearing through Accredited Institutes and not for direct applicants. However the facility is available to a candidate who might have completed lower level as a direct candidate and wishing to appear for immediate higher level through Accredited Institutes.

c) The facility is also not available to the candidates those who might be appearing through Accredited institute but have cleared lower level prior to the preceding exam (e.g. if a candidate has passed 'A' Level Exam in Jan, 2010 he would be eligible for this facility in case he wishes to appear for 'B' Level Examinations in July, 2010 through Accredited Institute. If, however, he had passed 'A' Level prior to Jan., 2010 Exams, this facility would not be available to him).

d) This facility would also not be available to the candidate opting for Level jumping (e.g. from 'O' to 'B' or 'A' to 'C' Levels).

Once registered at a particular level, the registration is valid for ten consecutive examinations for 'A' Level, reckoned from the specific examination as indicated in the Registration allocation letter issued to the candidates.

Registration, by itself, does not entitle a candidate to appear for an examination at the Level concerned, unless all conditions, stipulated in the examination application form, and in any other notification, relevant to the examination are fulfilled by the candidate.

**Re-registration:**

Candidates who are not able to clear the level within the validity period of initial registration, are allowed to re-register for once, at the same level for another full term i.e. 5 years to clear the left over papers by submitting filled in Registration application and full Registration fee within one year of the expiry of the validity period of existing Registration.

**PRACTICAL EXAMINATION SCHEME**

**No of Practical Examination** : Two
**Duration of each Examination** :Three hour duration including viva-voce
**Max. marks in each Examination** : 100=80 (Practical) + 20 (Viva)

**Grading** : Students will be awarded grades in practical examinations based on the marks scored by them in the practical and viva voce. Every candidate has to pass in both Practical and Viva examinations.

**Date(s)** :**Date(s) will be announced on the DOEACC website.**

The examinations will be conducted by the Society in reputed institutions for all candidates.
The institutes are obliged to facilitate the conduct of Practical examinations and arrange infrastructure, faculty for the conduct of practical examination. The institutes are not allowed to charge any fee from the candidates, for the practical examination.

9. **HARDWARE REQUIREMENT FOR 'A' LEVEL COURSE**

9.1 **Computer configuration recommended**

| | | |
|---|---|---|
| Processor | : | 1 GHz or higher |
| RAM | : | 128 MB or higher |
| HDD | : | 40 GB or higher |
| Monitor | : | SVGA |
| Mouse | : | Windows compatible |
| Keyboard | : | Standard |
| NIC | : | Standard |
| Optical Drive | : | Standard |
| Speaker, Mic, Webcam | : | Standard |

### 9.2    Printer

Laser printer / Inkjet Printer  :        Standard
Dot matrix printer              :        Standard

OHP /LCD Projector              :        Standard

MODEM, DIAL UP/DSL              :        Standard

SCANNER                         :        Standard

Sufficient number of Computers / nodes in Client server configuration mode satisfying the criteria of accreditation.

### 9.3    Networking

NIC                                   :        Standard
RJ-45 Connector                       :        Standard
Crimping Tools                        :        Standard
UTP/STP/Coaxial Fiber  Optic
Cables and their connectors           :        Standard
8/16 port Hub/Switch                  :        Standard
Wi-H Router                           :        Standard

### 10.   SOFTWARE REQUIREMENT FOR 'A' LEVEL COURSE

Operating system       :       Linux / Windows / 2000/xp/vista
NOS                    :       Linux / Unix / Windows /
SW Packages            :       Star Office / MS Office, Internet Explorer, Internet Explorer / Web Publishing Tool, JDK / Oracle J Developer2,  AUTOCAD/CorelDraw / MS Visio, Microsoft Visual Studio .Net.
                               Oracle / SQL Server. Standard Multimedia Tools
Compilers              :       C & C++ Compiler.
Antivirus package      :       Standard

# PARITY TABLE BETWEEN REVISION II (w.e.f July 1999) , REVISION III (w.e.f January 2003) and REVISION IV (w.e.f January 2010) of DOEACC Syllabus ('A' LEVEL)

| Revision II | | Revision III | | Revision IV | |
|---|---|---|---|---|---|
| CODE | MODULES | CODE | MODULES | CODE | MODULES |
| A1 | Personal Computer Software | A1-R3 | IT Tools and Applications | A1-R4 | IT Tools and Business System |
| A2 | Elective (one subject out of A2.1 & A2.2 is to be chosen) | | | | |
| A2.1 | Business Systems | A2-R3 | Business Systems | A1-R4 | IT Tools and Business System |
| A2.2 | ERP Fundamentals | | No Equivalence | | No Equivalence |
| A3 | I Computer Organization and System Software | A4-R3 | Computer Organization | A4-R4 | Computer System Architecture |
| A4 | Programming and Problem Solving through 'C' language | A3-R3 | Programming and Problem Solving through 'C' Language | A3-R4 | Programming and Problem Solving through 'C' Language |
| A5 | System Analysis, Design and MIS | A5-R3 | Structured System Analysis & Design | A5-R4 | Structured System Analysis & Design |
| A6 | Data Structure through "C" Language | A6-R3 | Data Structure through "C" Language | A6-R4 | Data Structure through C++ |
| A7 | Introduction to Database Management | A7-R3 | Introduction to Database Management | A7-R4 | Introduction to Database Management System |
| A8 | Computer Graphics | A10.3-R3 | Computer Graphics | | No Equivalence |
| A9 | Data Communication and Network | A9-R3 | Data Communication and Network | A9-R4 | Data Communication and Network Technologies |
| A10 | Elective (one subject out of A10.1, A10.2, A10.3 & A10.4 is to be chosen) | | | | |
| A10.1 | Unix and Shell Programming | A8-R3 | Basics of OS, Unix & Shell Programming | A8-R4 | Basics of OS, Unix & Shell Programming |
| A10.2 | Introduction to Object Oriented Programming and C++ / Visual C++ | A10.1-R3 | Introduction to Object Oriented Programming and C++ | A10.1-R4 | Introduction to Object Oriented Programming through Java |
| A10.3 | Programming in Java | A10.2-R3 | Introduction to Object Oriented Programming through Java | A10.1-R4 | Introduction to Object Oriented Programming through Java |
| A10.4 | Introduction to Object Oriented Programming and Visual Basic | A10.2-R3 | No Equivalence | | No Equivalence |

1. The above table shows the equivalence between the modules of old syllabus (Revision II & III) and the new syllabus (Revision IV).
2. Candidates would not be allowed to appear in the equivalent papers of the Revision IV (new syllabi), if they have already passed the relevant papers in earlier revision.
3. Candidates would have to pass a total of 10 papers and 2 practical in order to qualify 'A' Level in Revision IV syllabus.
4. Candidates would be allowed exemption in equal number of papers which they have passed in Revision II or Revision III (old syllabus) and which have no equivalence in the Revision IV (New Syllabus). In case of elective papers, candidates would be exempted in that module which includes these electives, e.g. (i) if a candidate has cleared A4 / A3-R3 then he will be exempted module 3 of Revision IV syllabus (ii) if a candidate has cleared A2.1 and A1-R3 then he will be exempted from module 1 and any other module of his choice of the Revision IV syllabus. (iii) if a candidate has cleared A10.2 / A10.1-R3 then he will be exempted from module 10 of the Revision IV syllabus.

# A1-R4: IT TOOLS AND BUSINESS SYSTEM

## Objective of the Course

The goal of this course is to present overview of IT tools used in day to day use of computers and data base operations. The Course has been designed to provide knowledge on various hardware and software components of computer, operating system, various packages used for different applications, data base concepts & operations and various issues related to IT and application of IT.

At the end of the course the students will be able to:-

- Acquire the foundation level knowledge required to understand computer and its operations.
- Understand the hardware and software components of the computer.
- Understand the basic concept of operating system and get knowledge about various different operating systems.
- Understand to use the packages of word processing, spread sheet and presentation in detail.
- Understand various data base concepts and operations.
- Understand the issues related to IT and IT applications.

## Outline of Course

| S. No. | Topic | Minimum number of hours |
|---|---|---|
| 1. | Computer Appreciation | 04 |
| 2. | Computer Organization | 06 |
| 3. | Operating System | 13 |
| 4. | Word Processing | 06 |
| 5. | Spreadsheet Package | 09 |
| 6. | Presentation Package | 05 |
| 7. | Data Base Operations | 13 |
| 8. | Information Technology and Society | 04 |

| | | |
|---|---|---|
| **Lectures** | **=** | **60** |
| **Practical/Tutorials** | **=** | **60** |
| **Total** | **=** | **120** |

## Detailed Syllabus

**1. Computer Appreciation**                                                      **04Hrs.**
Characteristics of Computers, Input, Output, Storage units, CPU, Computer System, Binary number system, Binary to Decimal Conversion, Decimal to Binary Conversion, ASCII Code, Unicode.

**2. Computer Organization**                                                      **06 Hrs.**
Central Processing Unit - Processor Speed, Cache, Memory, RAM, ROM, Booting, Memory- Secondary Storage Devices: Floppy and Hard Disks, Optical Disks CD-ROM,

DVD, Mass Storage Devices: USB thumb drive. Managing disk Partitions, File System Input Devices -   Keyboard, Mouse, joystick, Scanner, web cam, Output Devices- Monitors, Printers – Dot matrix, inkjet, laser, Multimedia-  What is Multimedia, Text, Graphics, Animation, Audio, Images, Video; Multimedia Application in Education, Entertainment, Marketing. Names of common multimedia file formats, Computer Software-   Relationship between Hardware and Software; System Software, Application Software, Compiler, names of some high level languages, free domain software.

## 3. Operating System                                                                     13 Hrs.
Microsoft Windows- An overview of different versions of Windows, Basic Windows elements, File management through Windows. Using essential accessories: System tools – Disk cleanup, Disk defragmenter, Entertainment, Games, Calculator, Imaging – Fax, Notepad, Paint, WordPad. Command Prompt- Directory navigation, path setting, creating and using batch files. Drives, files, directories, directory structure. Application Management: Installing, uninstalling, Running applications. Linux- An overview of Linux, Basic Linux elements: System Features, Software Features, File Structure, File handling in Linux: H/W, S/W requirements, Preliminary steps before installation, specifics on Hard drive repartitioning and booting a Linux system.

## 4. Word Processing                                                                     06 Hrs.
Word processing concepts: saving, closing, Opening an existing document, Selecting text, Editing text, Finding and replacing text, printing documents, Creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout.

Editing and Profiling Tools: Checking and correcting spellings. Handling Graphics, Creating Tables and Charts, Document Templates and Wizards.

## 5. Spreadsheet Package                                                                 09 Hrs.
Spreadsheet Concepts, Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell / formula Copying and Moving from selected cells, handling operators in Formulae, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard.

Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts.

Integrating word processor, spread sheets, web pages.

## 6. Presentation Package                                                                05 Hrs.
Creating, Opening and Saving Presentations, Creating the Look of Your Presentation, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows, Running and Controlling a Slide Show, Printing Presentations.

## 7. Data Base Operations                                                                13 Hrs.
Data Manipulation-Concept: Database, Relational Database, Integrity.   Operations: Creating, dropping, manipulating table structure. Manipulation of Data: Query, Data Entry Form, Reports.

## 8. Information Technology and Society                                                   04 Hrs.

Indian IT Act, Intellectual Property Rights – issues. Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies.

**RECOMMENDED BOOKS**

**MAIN READING**

1. P.K. Sinha and P. Sinha, " Foundations of Computing" , BPB Publication, 2008.
2. Sagman S, "MS Office for Windows XP", Pearson Education, 2007.
3. ITL Educational Society, "Introduction to IT", Pearson Education, 2009.
4. Miller M, "Absolute Beginners Guide to Computer Basics", Pearson Education, 2009.

**SUPPLEMENTARY READING**

1. Turban, Mclean and Wetherbe, "Information Technology and Management" John Wiely & Sons**.**
2. Mansfield Ron, "Working in Microsoft Office", 2008, Tata McGraw-Hill
3. Balagurusamy E, "Fundamentals of Computers", 2009, Tata McGraw-Hill
4. Mavis Beacon, "All-in-one MS Office" CD based views for self learning, BPB Publication, 2008
5. Perry G, "MS Office 2007", Pearson Education, 2008.
6. D'Suoza & D'souza, "Learn Computer Step by Step", Pearson Education, 2006.
7. Kulkarni, "IT Strategy for Business", Oxford University Press

**Refer: Open Office/ MS Office Environment for practice.**

# A1-R4 IT TOOLS AND BUSINESS SYSTEM

## Model Question Paper

**NOTE:**

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

**TOTAL TIME**: 3 HOURS

**TOTAL MARKS: 100**
**(PART ONE - 40; PART TWO - 60)**

## PART ONE
### (Answer ALL Questions; each question carries ONE mark)

**1. Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1 Which type of software provides additional functionality to your operating system?
   a) System software
   b) Operating system software
   c) Utility software
   d) Application software

1.2 Which of the following detects the presence or absence of a mark in a predetermined place?
   a) Pointing stick
   b) Bar code reader
   c) Optical mark reader
   d) Trackball

1.3 To create a capital letter, you must use which special key simultaneously with the letter key?
   a) Enter
   b) Esc
   c) Tab
   d) Shift

1.4 What type of software would you need to create an invitation to your birthday party?
   a) Spreadsheet
   b) Database
   c) Word processing
   d) Desktop publishing

1.5 In a word processing program, word wrap refers to:

a)	Typing that extends beyond the right margin then automatically continues onto the next line.
b)	Finishing a document.
c)	Words that are unacceptable.
d)	Words with too little space between them.

1.6	A space near the top of the spreadsheet where the formulas or other information in the active cell can be viewed is called the:
a)	address label
b)	title bar
c)	entry bar
d)	active cell

1.7	What is the binary number for the decimal number 217 ?
a)	11011001
b)	11101001
c)	10110101
d)	11000001

1.8	Which of the following translates a program written in a high-level language into machine code?
a)	an assembler
b)	a compiler
c)	an operating system
d)	an editor

1.9	Of the following components of a computer, which one performs computations?
a)	output device
b)	arithmetic/logic unit
c)	control unit
d)	memory unit

**2.	Each statement below is either TRUE or FALSE.	Identify and mark them accordingly in the answer book.**

2.1	The speed of a cpu is measured by the amount of time it takes to execute one machine cycle.
2.2	You can embed sounds, video clips, and animations into your word-processed document.
2.3	ROM doesn't lose data when you switch the computer off.
2.4	Operating systems are software systems that help make it more convenient to use computers and manage the transitions between multiple jobs.
2.5	In a computer, data is represented electronically by pulses of electricity.
2.6	The computer uses decimal number system for all computations
2.7	Hexadecimal number system is a compact representation of the binary number system.
2.8	The ASCII code for upper case and lower case alphabets is the same.
2.9	Microsoft Windows is a word processing system.
2.10	Computer memory is usually organized in bytes.

**3.	Match words and phrases in column X with the nearest in meaning in column Y.**

|   | **X** |  | **Y** |
|---|---|---|---|
| 3.1 | software | a) | transforming data into information |
| 3.2 | instructions | b) | data that has been organized or presented in a meaningful fashion |
| 3.3 | operating system | c) | any part of the computer that you can physically touch |
| 3.4 | processing | d) | a set of computer programs that enables hardware to perform different tasks |
| 3.5 | information | e) | the most common type of system software, it controls the way in which the computer system functions |
| 3.6 | data | f) | the main circuit board in the system unit |
| 3.7 | Memory | g) | the representation of a fact or idea (unprocessed information) |
| 3.8 | system software | h) | holds instructions or data that the CPU processes |
| 3.9 | storage | i) | processed data or information |
| 3.10 | motherboard | j) | data or information that can be accessed again |
|  |  | k) | the set of programs that enables computer hardware devices and application software to work together |
|  |  | l) | steps and tasks necessary to process data into usable information |

**4.    Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:**

| (a) Read | (b) magneto-optical | (c) Attachment | (d) Thesaurus | (e) backup |
|---|---|---|---|---|
| (f) Operating system | (g) Microprocessor | (h) Netiquette | (i) Assembler | (j) algorithm |

4.1    A storage device that uses a combination of magnetic and optical (laser) technologies is a _____ storage device.

4.2    A(n) _____ is the CPU of a computer.

4.3    A(n) _____ is a program that converts an assembly language program to a machine language program.

4.4    The operation that takes data out of a specific memory location is the _____ operation.

4.5    _____ is an electronic document such as a Word file that is sent along with an email message

4.6    _____is a part of your Word Processor that will give you a list of antonyms or synonyms for chosen words

4.7    A _____ is a copy of one or more files created as an alternate in case the original data is lost or becomes unusable.

4.8    _____ involves respecting others' privacy and not doing anything online that will annoy or frustrate other people.

4.9    _____is the software that communicates with computer hardware on the most basic level.

4.10    An _____ is a set of instructions, sometimes called a procedure or a function, that is used to perform a certain task on a computer.

## PART TWO
### (Answer ANY FOUR questions)

**5.**
  a. Differentiate between (i) Control Unit and Arithmetic Logic Unit (ALU) (ii) Volatile Storage and Non volatile Storage (iii) System Software and Application Software (iv) Impact and non impact printer
  b. What are the components of Central Processing Unit? What are their functions?

**(8+7)**

**6.**
  a. What are the principal functions of an Operating System? What is a multitasking operating system
  b. Give the differences between compiler and interpreter?
  c. As working with Linux OS all files and directories have security permissions; what are those and how <u>chmod</u> command helps in operating all those permissions?

**(5+5+5)**

**7.**
  a. What is a template and what are the advantages and disadvantages of using one?
  b. What is mail merge? Explain the steps to mail merge two documents using MS-WORD?
  c. What is the role of "Control Panel" in Windows?

**(5+5+5)**

**8.**
  a. What are the main functions of Database Management System (DBMS)? How will you differentiate it from File Management System?
  b. Why is data validation necessary? What are the different types of data validation checks that are kept in a programme?
  c. Define the meaning of Data Structures.

**(5+5+5)**

**9.**
  a. Explain about Animating Text and Objects on the Slides of your Presentation.
  b. What is the difference between relative and absolute references?
  c. What is the purpose of Presentation Software in edutainment? Explain the features provided by Power Point softwares of embedding video and animations.

**(5+5+5)**

# A1-R4: IT TOOLS AND BUSINESS SYSTEM

**Assignment 1.**

In a library, librarian has to maintain various books. He has made various categories according to the subject. The tree structure for the various directories are shown below

**Subjects**
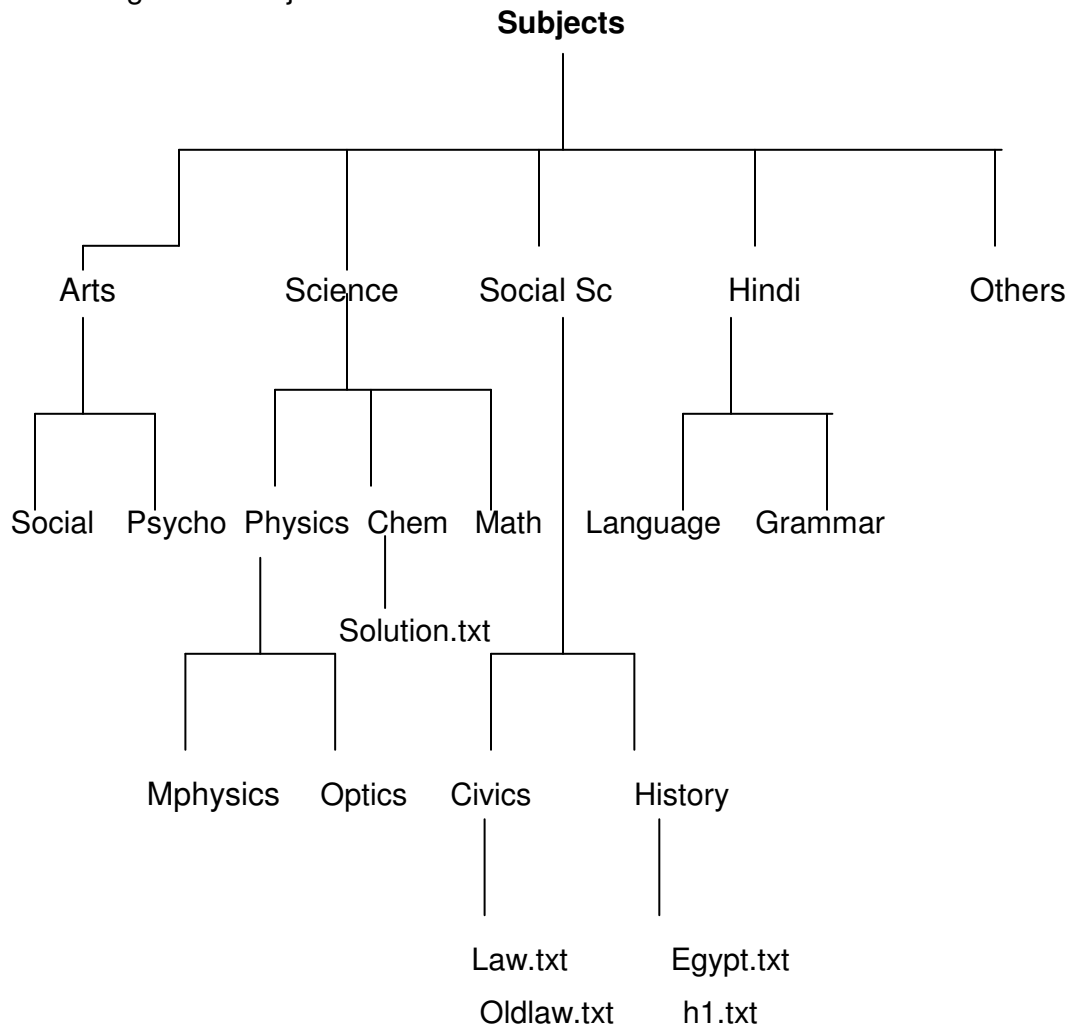


Create the above structure using DOS Commands.

Using the above tree structure do the following

(a) Imagine you are in psycho directory and from this location copy all files of Civics directory to the Others directory.
(b) List all the files of civics directory using the same location.
(c) Copy all the directories and subdirectories of SocialSc to others.

**Assignment 2.**

Imagine you are in the 'others' directory. From this location give the DOS commands for the following

(a) Display all the files of civics directory

(b) Delete the files from the mphysics physics
(c) Display all the files, which have extension of 'txt' under the 'math' directory.
(d) Copy the directory 'optics' under the 'mphysics' directory.

## Assignment 3.

Create the following folders under the specified locations using windows.

a)  D1 on desktop
b)  R1 on the c: i.e. root
c)  D2 on desktop
d)  R2 on the c:

Do the following:

(i)  Create a folder D1-1 under the D1 folder
(ii) Create a folder D2-1 under the D2 folder
(iii) Copy this D2-1 folder and paste it under R1 folder.
(iv) Delete the folder D2-1 from R1 folder
(v) Create the folder R1-1 under R1 folder
(vi) Copy R1-1 folder under the R2 folder
(vii) Rename folder R1-1 under R2 folder as 'subfolder of R2'
(viii) From the c: copy all files to folder R2
(ix) Delete all the files from the folder R2
(x) Recover all the deleted files

## Assignment 4.

Do the following
(i)   Interchange the functions of left and right mouse buttons.
(ii)  Change the wallpaper of your computer and set it to a paint brush file
      made by you.
(iii) Change the screen saver of your computer and change it to 'marquee' ,
      set your name as the text and wait time should be 2 minutes.

## Assignment 5.

Do the following settings

a)  Display pointer trails
b)  Change the normal pointer of a mouse to another pointer
c)  Set the date advanced by 2 months
d)  Reset the system date & time
e)  Set the system time late by 2 hrs: 40 minutes.

## Assignment 6.

Create a document in Word on a topic of your choice. Format the document with various fonts (minimum 12, maximum 15) and margins (minimum 2, maximum 4). The document should include

a)  A bulleted or numbered list
b)  A table containing name, address, basic pay, department as column heading
c)  A picture of lion using clip art gallery

    d) An example of word art

    e) A header with student name & date

    f) A footer with pagination

## Assignment 7.

Create a document with the text given below and save it as **First.Doc**

A Read only Memory is a memory unit that performs the read operation only, it does not have a write capability. This implies that binary information stored in a ROM is made permanent during the hardware production of the unit and cannot be altered by writing different words into it. Whereas a RAM is a general-purpose device whose contents can be altered during the computational process, a ROM is restricted to reading words that are permanently stored with in the unit. The binary information to be stored, specified by the designer, is then embedded in the unit to form the required interconnection pattern.

Do the following

    a) Count the occurrences of the word "ROM" in the above document.

    b) Replace ROM with Read Only Memory in the entire document

    c) Underline the text Read Only Memory

    d) Make an auto correct entry for ROM and it should be replaced by Read Only Memory

## Assignment 8.

Use first.doc to perform the following operations

    a) Make the first line of document bold

    b) Make the second line italic

    c) Underline the third line

    d) Align the fourth line to center

    e) Make the font color of first line as red

    f) Change the font style of fifth line to Arial

    g) Change the second line to 18 points

    h) Insert the date & time at the start of document

## Assignment 9.

Use the document earlier saved and perform the page setting as follows

| | |
|---|---|
| Top Margin | 1.3" |
| Bottom margin | 1.4" |
| Left margin | 1.30" |
| Right margin | 1.30" |
| Gutter margin | 1.2" |
| Header | 0.7" |
| Footer | 0.7" |
| Paper size | executive |
| Orientation | landscape |

**Assignment 10.**

Insert a table. The table should have 5 columns. The auto behavior should be 'Fixed column width'. The following report has to be created in the table.

| Sr. No. | Name | Basic Pay | Designation | Department |
|---------|------|-----------|-------------|------------|
| 1 | Rahul Roy | 10000/- | MD | Marketing |
| 2 | Ritu Garg | 12000/- | AD | Sales |
| 3 | Mohit | 8000/- | Manager | Sales |
| 4 | Rakesh | 9000/- | Senior Manager | HR |

(a) Heading should have a font size of 18, color should be blue and font should be bold.
(b) The data should have a font size of 12, color should be Red and font should be italic
(c) Insert a new row between 3 & 4 and type the data and reorder the sr. no column.

**Assignment 11.**

Create a table in word as shown below

| Roll No | Name | Marks in Physics | Marks in Chemistry | Total Marks |
|---------|------|------------------|--------------------|-------------|
| 1 | Ritu | 80 | 70 | |
| 2 | Rohit | 70 | 80 | |
| 3 | Amit | 60 | 50 | |
| 4 | Rakesh | 40 | 60 | |
| 5 | Niti | 30 | 70 | |
| 6 | Garima | 80 | 80 | |

Do the following

(a) In the total marks column, entries should be calculated using formulas and it is the sum of marks in physics and marks in chemistry.
(b) Insert a new row at the end of the table and also find grand total using formula.
(c) Sort the table based on total marks
(d) The date and heading should be center aligned
(e) Heading should be in bold and underlined

**Assignment 12.**

Below is given a letter and some addresses, this letter is to be sent to all these addresses, so use mail merge option to do so

**Addresses are:**

1) Amit

H No 424 sector 8D
Chandigarh

2) Rohit
   H No 444, Sector 125C
   Chandigarh

3) Jyoti
   H NO 550, Sector 16A
   Chandigarh

**The Letter is**

To
        <<Name>>
        <<Address>>
Dear <<Name>>

        You are called for an interview on the <<Date>>at 9:00 A.M with your original documents

                                        Yours Sincerely
                                        ABC Limited
                                        Phase –7
                                        Mohali

**Assignment 13.**

Make a template for the bio-data with the following format

### Bio-Data

**Name**                    :

**Father's Name**           :

**Date of Birth**           :

**Age**                     :

**Address**                 :

**Educational Qualification**

| Sr No | Qualification | Board | Percentage |
|-------|---------------|-------|------------|
|       |               |       |            |
|       |               |       |            |
|       |               |       |            |
|       |               |       |            |

Work Experience:

## Assignment 14.

Make a document with the following

1. It should have 3 pages
2. It should have bookmarks named book1, book2, and book3 for the respective pages.
3. Using go to command go to the
    i) Page no 2
    j) Bookmark named book3
4. Insert one page break on page 2 to make total no. of pages 4.
5. Insert page number at each page

## Assignment 15.

(i) Make an auto correct entry so that

a) Teh is replaced by The
b) Nmae is replaced by Name
c) Abouta is replaced by About a

(ii) Define a Macro 'Decorate' which makes the text bold, Red in color and italic, font size 14. Assign a shortcut key Alt + Z to this macro.

## Assignment 16.

Type the following data in excel worksheet and save it as first.xls

| A | B | C | D | E |
|---|---|---|---|---|
| 513 | | | | |
| 501 | | | | |
| 504 | | | | |
| 513 | | | | |
| 511 | | | | |
| 516 | | | | |
| 532 | | | | |
| 504 | | | | |
| 432 | | | | |
| 501 | | | | |
| 510 | | | | |
| 517 | | | | |
| 479 | | | | |

| | | | | |
|---|---|---|---|---|
| 494 | | | | |
| 498 | | | | |

Do the following

   (a)  Highlight column A and copy it to column C
   (b)  Sort the data in column C in ascending order
   (c)  What is the lowest number in the list (use a function)
   (d)  Copy the data in column A to column E and sort it in descending order
   (e)  What is the highest number in the list (use a function)
   (f)  How many numbers in this list are bigger than 500 (use a database  function)
   (g)  How many numbers in column A are between 520 and 540 inclusive
        (use a database  function)

## Assignment 17.

 Type the following data in excel worksheet and save it as second.xls.

| A | B | C | D |
|---|---|---|---|
| People per physician | Life Expectancy | | |
| X | Y | X * Y | |
| 370 | 70.5 | | |
| 6166 | 53.5 | | |
| 684 | 65 | | |
| 449 | 76.5 | | |
| 643 | 70 | | |
| 1551 | 71 | | |
| 616 | 60.5 | | |
| 403 | 51.5 | | |

   Do the following

   (a) Complete column C for finding product x * y
   (b) Find sum of x column at the end of data
   (c) Find sum of y column at the end of data
   (d) Find sum of x * y  column at the end of data
   (e) Find sum of x^2
   (f)  Find sum of y^2

## Assignment 18.

Enter the following data and save it in grade .xls

| Name | Marks1 | Marks2 | Marks3 | Total | Percentage | Grade |
|------|--------|--------|--------|-------|------------|-------|
| Amit | 80 | 70 | 80 | | | |
| Renu | 70 | 60 | 90 | | | |
| Rajeev | 60 | 50 | 80 | | | |
| Manish | 50 | 30 | 90 | | | |
| Sanjeev | 40 | 40 | 80 | | | |
| Anita | 70 | 70 | 90 | | | |

Do the following

(a) Compute the total marks and percentage of each student by entering appropriate formula.
(b) Compute the grades based on following criteria

If percentage >= 90 then grade = A
If percentage >= 80 and <90 then grade = B
If percentage >= 70 and <80 then grade = C
If percentage >= 60 and <70 then grade = D
If percentage < 60 then grade = E

## Assignment 19.

Using grade.xls to perform the following formatting operations

(a) Draw a border around the worksheet
(b) Change the font size of heading to 14 points and underline it and hide column c
(c) Increase the width of column A to 15 characters
(d) Right Align the values in column B, C, F

## Assignment 20.

A university maintains a year wise result for four courses and then generates an average report as given below

| Sr no. | Year | Course1 | Course2 | Course3 | Course4 | Average |
|--------|------|---------|---------|---------|---------|---------|
| 1 | 2002 | 356 | 300 | 300 | 400 | |
| 2 | 2003 | 200 | 400 | 200 | 450 | |
| 3 | 2004 | 256 | 500 | 400 | 600 | |
| 4 | 2005 | 400 | 600 | 500 | 550 | |
| 5 | 2006 | 456 | 450 | 550 | 450 | |
| 6 | Total | | | | | |

(a) Complete the report to calculate the course wise average in row 6
(b) Provide formula to calculate year wise average in column G

(c) Generate a column chart to compare data

## Assignment 21.

A person wants to start a business and he has four schemes to invest money according to profit and years. Find out which scheme is the most profitable.

| Investment Amount | Percentage for Profit | No of years |
|---|---|---|
| 20000 | 10% | 6 years |
| 40000 | 20% | 5 years |
| 14000 | 30% | 4 years |
| 12000 | 15% | 5 years |

## Assignment 22.

A company records the details of total sales (in Rs. ) sector wise and month wise in the following format

|  | Jan | Feb | March | April |
|---|---|---|---|---|
| Sector 30 | 12000 | 17000 | 14000 | 15000 |
| Sector 22 | 14000 | 18000 | 15000 | 16000 |
| Sector 23 | 15000 | 19000 | 16000 | 17000 |
| Sector 15 | 16000 | 12000 | 17000 | 18000 |

(a) Enter the data in a worksheet and save it as sector.xls
(b) Using appropriate formula, calculate total sale for each sector
(c) Create a 3-D column chart to show sector wise data for all four months
(d) Create a 3-D pie chart to show sales in Jan in all sectors

## Assignment 23.

Type the following data and save it in employee.xls

| Name | Department | Designation | Salary | Address |
|---|---|---|---|---|
| Anju | TRG | MD | 100000 | CHD |
| Amit | TRG | AD | 200000 | MOHALI |
| Renu | BILL | MD | 300000 | CHD |
| Anita | BILL | AD | 20000 | MOHALI |
| Shivani | S/W | MD | 10000 | CHD |

Do the following

(a) Count the total no. of employees department wise
(b) List the name of employees whose designation is 'MD'
(c) List the name and department of employees whose address is Chandigarh
(d) List the name of employees whose salary is greater than 5000
(e) List the Address of employees whose department is 'TRG'


## Assignment 24.

Using above sheet do the following

(a) Count the total no. of employees who have salary greater than 10000
(b) Count the total no. of employees who are 'MD'
(c) Find the maximum salary department wise
(d) Find the minimum salary designation wise
(e) Count the employees for each designation for each department


## Assignment 25.

Create a table with the following field names in MS-Access

| Name of field | Data type |
|---|---|
| Book_name | Varchar |
| Purchase_date | Date |
| Price | Numeric |
| Author_name | Varchar |

Do the following

a) Enter 5 records in the table using forms
b) Display list of books in alphabetical order using reports
c) Display list of books in ascending order of price

## Objective of the Course

The aim of this course is to provide you the conceptual and technological developments in the field of Internet and web designing with the emphasis on comprehensive knowledge of Internet, its applications and the TCP/IP protocols widely deployed to provide Internet connective worldwide. The World Wide Web with its widespread usefulness has become an integral part of the Internet. Therefore, this course also puts emphasis on basic concepts of web design.

At the end of the course the students will be able to: -

- Review the current topics in Web & Internet technologies.
- Describe the basic concepts for network implementation.
- Learn the basic working scheme of the Internet and World Wide Web.
- Understand fundamental tools and technologies for web design.
- Comprehend the technologies for Hypertext Mark-up Language (HTML).
- Specify design rules in constructing web pages and sites.
- Effectively deal with programming issues relating to VB Script, JavaScript, Java, ASP, Front Page and Flash.
- Figure out the various security hazards on the Internet and need of security measures.

## Outline of Course

| S. No. | Topic | Minimum number of hours |
|---|---|---|
| 1. | Introduction to Internet | 02 |
| 2. | TCP/IP – Internet Technology and Protocol | 03 |
| 3. | Internet Connectivity | 03 |
| 4. | Internet Network | 04 |
| 5. | Services on Internet (Definition and Functions) | 04 |
| 6. | Electronic Mail | 07 |
| 7. | Current Trends on Internet | 03 |
| 8. | Web Publishing and Browsing | 10 |
| 9. | HTML Programming Basics | 12 |
| 10. | Interactivity Tools | 08 |
| 11. | Internet Security Management Concepts, Information Privacy and Copyright Issues | 04 |

| | | | |
|---|---|---|---|
| **Lectures** | **=** | **60** | |
| **Practical/tutorials** | **=** | **60** | |
| **Total** | **=** | **120** | |

## Detailed Syllabus

**1. Introduction to Internet**          **02 Hrs.**

Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Net etiquette. Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet.

**2. TCP/IP – Internet Technology and Protocol**                                         **03 Hrs.**
Packet switching technology, Internet Protocols: TCP/IP, Router, Internet Addressing Scheme: Machine Addressing (IP address), E-mail Addresses, Resources Addresses

**3. Internet Connectivity**                                         **03 Hrs.**
Connectivity types: level one, level two and level three connectivity, Setting up a connection: hardware requirement, selection of a modem, software requirement, modem configuration, Internet accounts by ISP: Telephone line options, Protocol options, Service options, Telephone line options – Dialup connections through the telephone system, dedicated connections through the telephone system, ISDN, Protocol options – Shell, SLIP, PPP, Service options – E-mail, WWW, News Firewall etc.

**4. Internet Network**                                         **04 Hrs.**
Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security, Network Components: Severs, Clients, Communication Media, Types of network: Peer to Peer, Clients Server, Addressing in Internet: DNS, Domain Name and their organization, understanding the Internet Protocol Address. Network topologies: Bust, star and ring, Ethernet, FDDI, ATM and Intranet.

**5. Services on Internet (Definition and Functions)**                                         **04 Hrs.**
E-mail, WWW, Telnet, FTP, IRC and Search Engine

**6. Electronic Mail**                                         **07 Hrs.**
Email Networks and Servers, Email protocols –SMTP, POP3, IMAp4, MIME6, Structure of an Email – Email Address, Email Header, Body and Attachments, Email Clients: Netscape mail Clients, Outlook Express, Web based E-mail. Email encryption- Address Book, Signature File.

**7. Current Trends on Internet**                                         **03 Hrs.**
Languages, Internet Phone, Internet Video, collaborative computing, e-commerce.

**8. Web Publishing and Browsing**                                         **10 Hrs.**
Overview, SGML, Web hosting, HTML. CGL, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Consideration and Principles, **Search and Meta Search Engines**, WWW, Browser, HTTP, Publishing Tools

**9. HTML Programming Basics**                                         **12 Hrs.**
HTML page structure, HTML Text, HTML links, HTML document tables, HTML Frames, HTML Images, multimedia

**10. Interactivity Tools**                                         **08 Hrs.**
ASP, VB Script, JAVA Script, JAVA and Front Page, Flash

## 11. Internet Security Management Concepts, Information Privacy and Copyright Issues
**04 Hrs.**

Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright Issues, basics of asymmetric cryptosystems.

**RECOMMENDED BOOKS**

**MAIN READING**

1. Greenlaw R and Hepp E "Fundamentals of Internet and www" 2$^{nd}$ EL, Tata McGrawHill,2007.
2. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3$^{rd}$ Edition, BPB Publications.
3. D. Comer, "The Internet Book", Pearson Education, 2009.

**SUPPLEMENTARY READING**

1. M. L. Young,"The Complete reference to Internet", Tata McGraw Hill, 2007.
2. Godbole AS & Kahate A, "Web Technologies", Tata McGrawHill,2008.
3. Jackson, "Web Technologies", Pearson Education, 2008.
4. B. Patel & Lal B. Barik, " Internet & Web Technology ", Acme Learning Publishers.
5. Leon and Leon, "Internet for Everyone",  Vikas Publishing House.

# A2-R4: INTERNET TECHNOLOGY AND WEB DESIGN

## Model Question Paper

**NOTE:**

| | |
|---|---|
| 1. | There are **TWO PARTS** in this Module/Paper.  **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions. |
| 2. | **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein.  **PART ONE** is **NOT** to be answered in the answer book. |
| 3. | Maximum time allotted for **PART ONE** is **ONE HOUR**.  Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned.  However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**. |

**TOTAL TIME: 3 HOURS**                              **TOTAL MARKS: 100**
                                                      **(PART ONE: 40; PART TWO: 60)**

## PART ONE
### (Answer all the questions; each question carries ONE mark)

**1.** **Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1. Which type of network is most  likely confined to a building or a campus
   a) Local area
   b) Metropolitan area
   c) Wide area
   d) Departmental

1.2. Which programming language always makes platforms-independent  application
   a) Java
   b) Visual basic
   c) C++
   d) C

1.3. Which best describes support over serial line communication under the TCP/IP Protocol .
   a) SLIP
   b) PPP
   c) Both A,B
   d) None

1.4. If a group of network computers connect to a central hub the network has what type of Physical Topology
   a) Ring
   b) Star
   c) Bus
   d) None

1.5.    If a group of computer connected to a central concentrator  the network has what
        type of logical topology?
        a)    Ring.
        b)    Sart
        c)    Bus
        d)    INone

1.6.    The transport layer protocol is
        a)    ALP
        b)    PPX
        c)    TCP
        d)    None

1.7.    The UDP is part of the which protocol suite
        a)    TCP/IP
        b)    IPX/SPX
        c)    Apple Talk
        d)    NetBEUI

1.8.    JDK  (Java Development Kit) include .
        a)    Java
        b)    Javac
        c)    JDB
        d)    All

1.9.    Buffer over flow attacks means
        a)    Collect and relay some data
        b)    Get full system access
        c)    Play and display advertisement
        d)    Slow down system

1.10.   A firewall can be
        a)    A Hardware
        b)    A  Software
        c)    Both software and Hardware
        d)    Network Engine

**2.      Each statement below is either TRUE or FALSE.   Identify and mark them
         accordingly in the answer book.**

2.1.    The Word Wide Web  is a very large set of interlinked hypertext documents
        accessed viahe Internet.
2.2.    World Wide Web is  synonymous with Internet.
2.3.    Packet switching is a network communications method that does not  groups all
        Transmitted data, irrespective of content, type, or structure into suitably-sized blocks,
        called packets
2.4.    The ARPANET computer network made a large contribution to the development of
        the  e-mail.
2.5.    SMTP is the push protocol that can not pull information from a remote server on
        demand.

2.6. Disaster recovery is the recovery of documents in case of destruction from fires, floods earthquake etc.
2.7. Streams can not controlled the flow of data from one source to another
2.8. The TCP/IP is slower then NetBEUI
2.9. A user level access is less secure then share level access
2.10. The ability of the new object to implement the base functionality of the parent object in new way is called inheritance

**3. Match words and phrases in column X with the nearest in meaning in column Y.**

| X | | Y | |
|---|---|---|---|
| 3.1 | server would constantly send new data to the client through the initial connection, that remains open | a) | Spoofing |
| 3.2 | A kind of forgery, mail assume to be send from know person but actually they are not | b) | SGML |
| 3.3 | It is an application-layer Internet standard protocol used by local e-mail clients to retrieve e-mail from a remote server over a TCP/IP connection | c) | Drug trafficking |
| 3.4 | It is an ISO Standard metalanguage in which one can define markup languages for documents .. | d) | Web server push |
| 3.5 | The ability of a system or product to work with other system or product without much efforts | e) | Web designing |
| 3.6 | Encoding data to make them unintelligible to unauthorized persons | f) | Thread |
| 3.7 | use of Internet to sell their illegal substances through encrypted e-mail and other Internet Technology | g) | Interoperability |
| 3.8 | Skill of designing hypertext presentation of Content delivered to end user | h) | Class Diagram |
| 3.9 | It can be divided into linear and non linear technique categories | i) | Scope |
| 3.10 | A single path of execution that is a sub process of the main process | j) | POP3 |
| | | k) | Encryption |
| | | l) | Multimedia |
| | | m) | nesting |

**4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below :**

| (a) Cache | (b) URL | (c) Cyberterrorism | (d) metadata, integration |
|---|---|---|---|
| (e) IMAP4 | (f) enterprise data modeling outer jain | (gHeader,Body | (h) CASCADE |
| (i) Interleaved main memory | (j) Virtual memory | (k) bus | (l) website |
| (m) Applet | | | |

4.1. Viewing a Web page on the World Wide Web normally begins by typing the _____ of the page into a Web browser.

4.2. Web page data may need not to be re-obtained from the source Web server. Almost all Web browsers _____ the recently obtained data on the local hard disk

4.3. The internet e-mail message consist of two major section that are _____ and _____

4.4. _____ is one of the two most prevalent protocol for e-mail retrieval.

4.5. _____ is act of terrorism committed through the use of cyberspace or computer

4.6. _____ and _____. are the part of the document management

4.7. _____ collection of information about a particular topic or subject

4.8. A class that has no direct instances, but whose descendants may have direct instances is called a _____ _____.

4.9. Java communicate with the web page through a special tag called _____.

4.10. In _____ topology all device connect to a common shared cable.

## PART TWO
### (Answer any FOUR questions)

**5.**
   a. What was the various firewall technique. (6)
   b. What is interoperability and how product or system achieve interoperability.
   c. Explain the advantages of Peer to Peer (P2P) network?

   **(6+5+4)**

**6.**
   a. What is the difference between SLIP and PPP ?
   b. Explain the difference between router, repeater and bridge
   c. Explain FDDI.

   **(6+5+4)**

**7.**
   a. What are the various network topologies explain with example.
   b. What is Net etiquette?

   **(10+5)**

**8.**
   a. What do you understand with e-commerce explain with example (8)
   b. Define document management

   **(8+7)**

**9.**
   a. Explain Web template system
   b. What is world wide web ? what is the contribution of java to the world wide web.
   c. What is token? List the various type of tokens supported by the java.

   **(4+6+5)**

## A2-R4 : INTERNET TECHNOLOGY AND WEB DESIGN

**Assignment – 1.**

**Internet Surfing**

   a) Open the website of Yahoo! with the help of Internet Explorer or Netscape Browser
   b) Check the properties of your browser.
   c) Change the Home Page of your browser.
   d) Check the History and clear the history.
   e) Create a Bookmark.

**Assignment – 2**

**Email**

   a) Create your email account on any of the familiar email services like hotmail, yahoo, rediffmail etc.
   b) Compose and send an email to a friend.
   c) Get the email addresses of five of your classmates.  Add them to the address book of your email program.  Send them each an email.
   d) Receive an email from a friend.
   e) Attach a document to the email.
   f) Retrieve an attachment from an email received.

**Assignment – 3**

**Search Engines**

   a) Open the search engines google and search for 'Doeacc'
   b) Check the Advanced Search Options of Google.
   c) Open the search engines Yahoo and search for 'Indian Railway'

**Assignment – 4**

**Web Chart and Usenet**

   a) Start Netscape and select Communicator, Messenger from the menu.  Try various ways of driving Usenet News via Netscape Messenger.  Look at some serious news group and set-up chat session.
   b) Open Windows Messenger and create a chat session with your friend

**Assignment – 5**

**Web Page Development -HTML**

Create a basic web page using Netscape Composer.  The topic of the web page is up to you (within acceptable use).

• Create a web page containing information about you, your family and friends.

Enter a suitable title for your page.  Add some sub-titles for different sections of your text.  For example, you could have a subheading for where you live, your family, your interests etc.

- Format the text of your web page in different Font, Alignment styles.  Move the cursor to a sub-title and set it to Heading2.

  Experiment with the different heading styles to see what each one does .Which of these styles do you think is useful?  Which are less useful?  Why?

  Experiment with the font size, color, style (bold, italic, underline, etc.) and alignment (left, center, right or indented.

- See the HTML that is generated by Browser by selecting View Page source.

- Add a picture to your web page.  You have scanned in, or one taken with a digital camera.  Alternatively, you can use a picture from another web page.  Remember that if you put pictures that you did not take on your web page, you must check for copyright permission first.

- Experiment with different sizes of picture and different locations within your web page.  Also, experiment with different alignment and text wrappings.  One minor problem with Netscape Composer is that it does not give proper WYSIWYG for pictures with text wrap.  You will have to save your page and view it in the browser to see exactly what the layout will be.

- Your HTML documents should have the following characteristics: -

  a) Use of paragraphs.
  b) Use of 1 or more levels of section headers.
  c) Use of highlighting (bold, italics, etc.)
  d) Use of lists.
  e) Use of internal links (to other parts of your document) commonly used for a document table of contents.
  f) Use of links to graphic images and alternate text, in case the image could not be found or is not loaded (alternatively).

By using the above items one should be able to create his/her own home page.

**Assignment – 6**

Create a document with two links to an external document.  The first link should lead to the beginning of the external document.  The second link should lead to a particular section in the external document.

In the external document specify a link that will lead to a particular section within it.

Text Content:

Welcome to our homepage
This page has links to the website of ABC Lever Inc.

For further information click on any of the following:

- About ABC Lever Inc.
- Contact Information

Content of Linked pages is

**Contact us**

ABC Lever Inc. is a conglomerate that has interests ranging from bodycare products to toilet soaps.

A couple of years ago we entered the frozen
Food industry through mergers and
Acquisitions.
Last year we started our plant to manufacture salt and this year it is wheat flour.
Our current turnover is about Rs. 7500 cr and by the next decade we are looking at a target of 15000 cr.

**Contact Us**

You can contact us at the following address:-

ABC Lever Inc.
101 Maker Chambers III,
Nariman Point,
Mumbai-21
Tel. 2102011

You can also email us at
customersservices@abclever.com

## Assignment – 7

Prepare a "resume.html" that might include such information as:
   a)  distinguishing marks
   b)  special interests
   c)  work history
   d)  education and training
   e)  job objective
   f)  relevant skills and experience

## Assignment – 8

Create the following HTML page
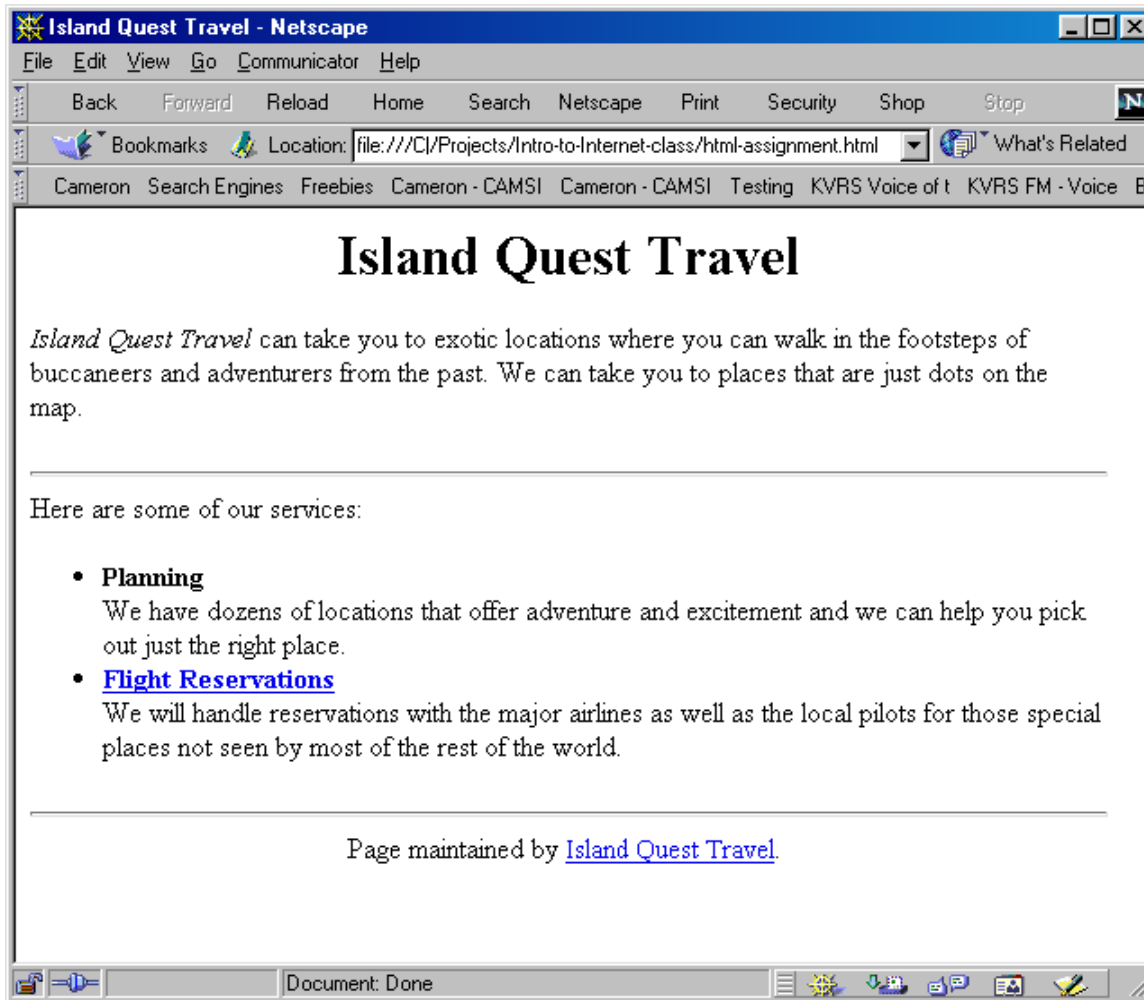
The keywords for the page are travel, recreation, and flight reservations.
The description for the page is
Island Quest Travel can help you make reservations for an exotic island vacation.
The words "Flight Reservations" links to a file called reservations.html.
The words "Island Quest Travel" are an email link to quest@travel.com

**Assignment – 9**

Design the form using HTML tags.

**Employment Exchange**

First Name    : [_____]

Second Name   : [_____]

Father's Name : [_____]

Date of Birth : [_____]

Sex Code          :  ☐   M  ☐   F

Qualification :  [High School    ▼]

Stream              [Science    ▼]

Percentage Marks : [    ]

Nationality    : [          ]

Religion         : [          ]

Category        : [SC          ▼]

Mailing Address   : [                    ]

[                    ]

Permanent Address : [                    ]

[                    ]

[OK]    [CLEAR]

**Assignment –10**

Design the following web page using HTML Tags:
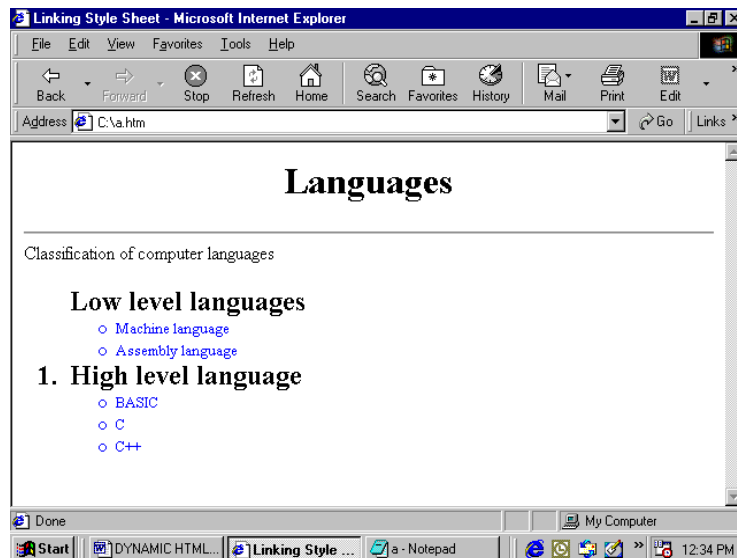
**Assignment –11**
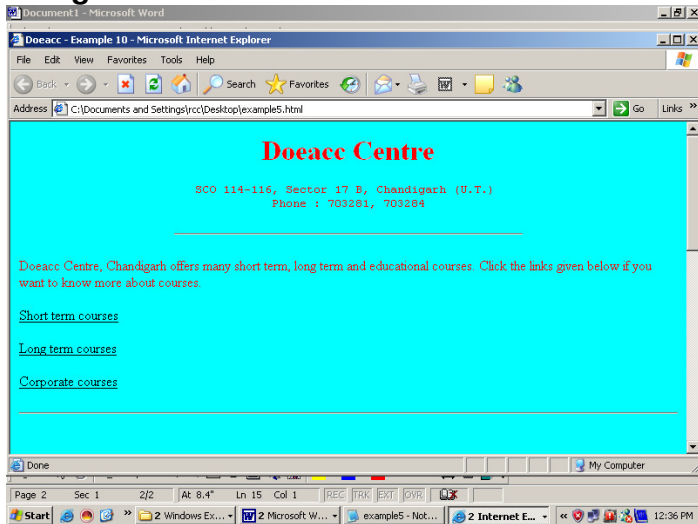


Design the above webpage in which the links for courses should be in the same page with the following details:

Short term Courses.
Doeacc Center offers following short-term courses

       a) Use of Personal Computer
       b) 'C' Language
       c) 'C++" Language
       d) Visual Basic
       e) Oracle/Dev. 2000
       f) AutoCAD
       g) Internet and Web Designing

Long term courses

Doeacc Center offers following long-term courses
       a) O' Level
       b) A' Level
       c) B' Level
       d) C' Level

Corporate courses

Doeacc Center offers following corporate courses
       a) Use of Personal Computer
       b) Courses according to their requirement

**Assignment – 12**

       a) Make a table with your friend's details in it.
       b) Column One, your friends names
       c) Column Two, Address of your friends
       d) Column Three, Mobile No of your friends

e) Column Four, Birth-Date of your friends

## Assignment – 13

a) Create a 4x3 table
b) Within each table, place 12 images of Indian Tourist Spots, in each box
c) Each image link to the corresponding site of Tourist Spot
d) Each Image must be at least 100x100 in size

## Assignment – 14

- Create a page with two frames
- The left frame of page contains the list of names & Images of the Indian National Hero's..
- On the left frame when you click on name or image, the details will be shown on the right frame.

## Assignment – 15

create a job application form
- Create an area called section one and place text boxes that receives details -
  a) Name
  b) Age
  c) Gender
  d) High School
  e) Qualifications

- Create an area called section two and place text boxes that receives details -
  a) Previous Employment
  b) References
  c) Qualification

- At the end place a submit button

## *Assignment – 16*

a) Take the picture of the motherboard
b) Place an image map on each item that is pointed out on the picture
c) Have them link to some information that you know about them.
d) There should be some sort of navigation or a back button on each page

Web Page Development – DHTML

## Assignment  – 17

Create a style in the <head> section
a) Change the lists size to h4
b) Change the links size to h2
c) Both should also have different colors

## *Assignment – 18*

Create a style in the <head> section
   a) Create a list of each persons first name in the class
   b) Have each name have a different color and or size
   c) your name must be the biggest

Web Page Development - VbScript

**Assignment – 19**

Write VbScript code for displaying an alert dialog box with OK button, welcoming a user with a message "Welcome To my Web Site".  As soon as the OK button is clicked, an image is displayed in the web browser.

**Assignment – 20**

Create a VbScript file that contains
   a) a textbox to accept a string and a button.
   b)  When user clicks the button the script checks whether that string is palindrome or not

Web Page Development – JavaScript

**Assignment – 21**

Validate the form in assignment -9 . The following validation checks are required:

   a) First name, second name should not be left empty
   b) Percentage marks should be numeric
   c) Mailing address must contain @ symbol in it.

**Assignment – 22**

Create a an HTML document containing JavaScript code that

   a) Has a button called check out
   b) when this button is clicked on , it summons two windows
   c) Window 1: Have a question that tells user to input value of the item
   d) Window 2: Have a question that requests the user to input the amount of sales tax

 Have a sentence that displays the cost of the item, the sales tax, and your final price.

**Assignment – 23**

 Create a document that reads and stores cookies containing a user name and number of times , he or she has visited your website . Whenever the user visits the site, the system displays the cookies in alert dialogue box, increments the counter cookie by 1 and then resets the counter's expiration date to one year from the current date.

**Assignment – 24**

Create an HTML document that calculates the square feet of carpet required to carpet a room . Include three text boxes ; Create one text box for width of room and another for

length of the room in linear feet . Also create a text box for the cost per square feet of carpeting. When you calculate the cost, add 25% to the total number of square feet to account for the closets and other features of the room. Display the total cost *in an alert* dialogue box.

**Assignment – 25**

Create a an HTML document with JavaScript code that

a) Has three textboxes and a button
b) The details to be accepted using textboxes are principal, rate of interest, and duration in years.
c) When user clicks the Ok button a message box appears showing the simple interest of principal amount

## A3-R4: PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

### Objective of the Course

The objectives of this course are to make the student understand programming language, programming, concepts of Loops, reading a set of Data, stepwise refinement, Functions, Control structure, Arrays. After completion of this course the student is expected to analyze the real life problem and write a program in 'C' language to solve the problem. The main emphasis of the course will be on problem solving aspect i.e. developing proper algorithms.

- After completion of the course the student will be able to
- Develop efficient algorithms for solving a problem.
- Use the various constructs of a programming language viz. conditional, iteration and recursion.
- Implement the algorithms in "C" language.
- Use simple data structures like arrays, stacks and linked list in solving problems.
- Handling File in "C".

### Outline of Course

| S. No. | Topic | Minimum number of hours |
|---|---|---|
| 1. | Introduction to Programming | 04 |
| 2. | Algorithms for Problem Solving | 10 |
| 3. | Introduction to 'C' Language | 04 |
| 4. | Conditional Statements and Loops | 07 |
| 5. | Arrays | 06 |
| 6. | Functions | 06 |
| 7. | Storage Classes | 03 |
| 8. | Structures and Unions | 06 |
| 9. | Pointers | 06 |
| 10. | Self Referential Structures and Linked Lists | 04 |
| 11. | File Processing | 04 |

| | | | |
|---|---|---|---|
| **Lectures** | **=** | **60** | |
| **Practical/tutorials** | **=** | **60** | |
| **Total** | **=** | **120** | |

### Detailed Syllabus

**1. Introduction to Programming** **04 Hrs.**
The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation

**2. Algorithms for Problem Solving** **10 Hrs.**
Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of

two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial

### 3. Introduction to 'C' Language                                    04 Hrs.

Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple 'C' programs.

### 4. Conditional Statements and Loops                                07 Hrs.
Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming .

### 5. Arrays                                                          06 Hrs.
One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Standard library string functions

### 6. Functions                                                       06 Hrs.
Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments.

### 7. Storage Classes                                                 03 Hrs.
Scope and extent, Storage Classes in a single source file: auto, extern and static, register, Storage Classes in a multiple source files: extern and static

### 8. Structures and Unions                                          06 Hrs.
Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions

### 9. Pointers                                                        06 Hrs.
Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.

### 10. Self Referential Structures and Linked Lists                  04 Hrs.
Creation of a singly connected linked list, Traversing a linked list, Insertion into a linked list, Deletion from a linked list

### 11. File Processing                                               04 Hrs.
Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file

**RECOMMENDED BOOKS**

**MAIN READING**

1. Byron S Gottfried "Programming with C" Second edition, Tata McGrawhill, 2007 (Paper back)
2. R.G. Dromey, "How to solve it by Computer", Pearson Education, 2008.
3. Kanetkar Y, "Let us C", BPB Publications, 2007.
4. Hanly J R & Koffman E.B, "Problem Solving and Programm design in C", Pearson Education, 2009.

**SUPPLEMENTARY READING**

1. E. Balagurusamy, "Programming with ANSI-C", Fourth Edition,2008, Tata McGraw Hill.
2. Venugopal K. R and Prasad S. R, "Mastering 'C'", Third Edition, 2008, Tata McGraw Hill.
3. B.W. Kernighan & D. M. Ritchie, "The C Programming Language", Second Edition, 2001, Pearson Education
4. ISRD Group, "Programming and Problem Solving Using C", Tata McGraw Hill,2008.
5. Pradip Dey , Manas Ghosh, "Programming in C", Oxford University Press, 2007.

# A3-R4: PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

## Model Question Paper

**NOTE:**

| | |
|---|---|
| 1. | There are **TWO PARTS** in this Module/Paper.  **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions. |
| 2. | **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein.  **PART ONE** is **NOT** to be answered in the answer book. |
| 3. | Maximum time allotted for **PART ONE** is **ONE HOUR**.  Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned.  However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**. |

**TOTAL TIME**: **3 HOURS**                                   **TOTAL MARKS:  100**
                                                              **(PART ONE - 40; PART TWO - 60)**

## PART ONE
### (Answer ALL Questions; each question carries ONE mark)

**1.** **Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1    The programming Language C  happens to be

    a)    An Assembly Level Language.
    b)    A High Level Language with some Assembly Level Language Features.
    c)    A Programming Language used only to write System Software.
    d)    A Programming Language used for developing Application Packages only.

1.2    The C declaration int I_a; implies

    a)    The variable I_a is a signed Binary Integer .
    b)    The variable I_a is an Unsigned Decimal Integer.
    c)    The variable I_a is an signed Hexadecimal  Integer.
    d)    The variable I_a is a signed  Integer that can be expressed in any Base.

1.3    The C statement  printf ("The Value =%x",62);  will print

    a)    The Value= 62
    b)    The Value = O62
    c)    The Value= OX 3C
    d)    The Value= 3C

1.4    In the following C declaration

```
    float F_C = 12.5;
   void   VF_A (int);
 int  main();   { /* begin main */
          float F_B;  F_C = 13.5;
```

...... 

return (0); }/* end main */

a)    The Variable  F_C is GLOBAL to both the functions main () as well as  VF_A.
b)    The Variable F_C is LOCAL to the function main();
c)    The Variable F_C is LOCAL to the function VF_A.
d)    The Variable F_C is EXTERNAL.

1.5    Consider the following C Program .

# define  S 10+2

#include <stdio.h>

```
 int main()
            { /* begin main */
                int  Result  = S + S ;

                printf ("\n\n Result = %d\n\n", Result ); /* Output Line #2 */

                return (0);
            } /* end main*/
```

The Output generated by the above  C Program will be

a)    Result = 10
b)    Result = 12
c)    Result = 24
d)    Result = 20

1.6    What will be the Output generated by the following C Program ?

```
#include <stdio.h>
 int main()
            { /* begin main */

                int I_C ; float F_D , F_E;

                I_C = 5/2 ; F_D = 5/2 ; F_E = 5/2.0;

                printf ("\n I_C = %d  F_D =%f  F_E = %f \n\n", I_C,F_D,F_E);

                return (0);

            } /* end main*/
```

a)    I_C= 1  F D = 2.0  F_E = 2.5
b)    I_C= 2  F D = 2.0  F_E = 2.5
c)    I_C= 2  F D = 2.5  F_E = 2.0
d)    I_C= 2  F D = 2.5  F_E = 2.5

1.7    In C Functions the actual expressions / parameters are passed on to Formal parameters using the method of :

a)     Call by reference.
b)     Call by Value Result.
c)     Call by Value.
d)     Call by Name.

1.8     Consider the following C program segment :

```
typedef  struct  Point
                { float  F_x;
float  F_y;
}Point_T;
typedef  struct  Circle
{ float  F_Radius;
  Point_T  R_Center;
} Circle_T;
int  main();
{ //  begin  main
Point_T  R_Point; Circle_T  R_Circle;
/* Circle  Manipulation  Statements */
return(0);
} //  end  main
```

To manipulate  a circle which of  the following set of assignment statements will have to be used ?

a)     R_Circle.F_Radius = 10.2; R_Circle.R_Center.F_x = 2.0 ; R_Center.F_y=3.0;
b)     R_Circle.F_Radius = 10; R_Circle..F_x = 2.0 ; R_Circle.F_y=3.0;
c)     R_Circle.F_Radius = 10.2; R_Circle.R_Center.F_x = 2.0 ;
d)     R_Circle.R_Center.F_y=3.0;
e)     R_Circle.F_Radius = 10.2; R_Circle.F_x = 2.0 ; R_Circle.F_y=3.0;

1.9     In the following C Declaration

```
#define CUI_Size 10
  typedef int AI_1D_01_T [CUI_Size];

int main()
   {/* begin main */
        AI_1D_01_T  AI_1D_A;
```
The variable AI_1D_A represents

a)     An  array of Integers of any size.
b)     An array of Integers having minimum 10 integers.
c)     An array of Integers having Maximum 10 Integers.
d)     None of the above.

1.10     Consider the following C Code

```
#include  <stdio.h>
#include  <stdlib.h>
int  main  ()
```

```
        {/*begin  main */
              int  I_X=6; int  *PI_Y;
    PI_Y  =  (int*)  malloc  (sizeof (int));
    *PI_Y  =  I_X;
    printf(" *PI_Y  =%d",*PI_Y);
    *PI_Y  =  7;
    printf ("  I_X  =  %d",I_X);
    return(0);
    }  //  end  main
```

Which, among the following  will it produce as output ?

a)      *PI_Y = 7  I_X = 6
b)      *PI_Y = 6  I_X = 7
c)      *PI_Y = 7  I_X = 6
d)      *PI_Y = 6  I_X = 6

**2.    Each statement below is either TRUE or FALSE.    Identify and mark them accordingly in the answer book**

2.1    In C  %x format can be used for Inputting  signed Octal Integers  (FALSE).
2.2    A Pointer variable content will be the Address of the variable it points to. (TRUE).
2.3    In C , a SINGLE scanf () can be used to read in the values of any number of pre-declared variables (TRUE).
2.4    Arrays in C are always stored in Column Major fashion (FALSE).
2.5    ! operator is a BINARY Operator in C. (FALSE).
2.6    Recursive functions provide an elegant way of representing  recurrences (TRUE).
2.7    Array represents a homogeneous Data Structure (TRUE).
2.8    A structure cannot be a member of an Union in C (FALSE).
2.9    In C *p++ increments the content of the location pointed to by p (TRUE).
2.10   A C Function can return a whole structure as it's value (TRUE).

**3.    Match words and phrases in column X with the nearest in meaning in column Y.**

| X | | Y | |
|---|---|---|---|
| 3.1 | Premature exit from within a C Loop | a) | 1 Byte. |
| 3.2 | Character variable will have a size of | b) | Indentation is essential |
| 3.3 | A C Function that do not return a value will be having | c) | Call by Reference. |
| 3.4 | A string in C is terminated by | d) | To open a file for writing after discarding it's previous content |
| 3.5 | To understand the Blocks of C | e) | An Integer type |
| 3.6 | Multiway branching in C can be implemented | f) | A void type |
| 3.7 | All variables declared inside a function | g) | Are Local to that function |
| 3.8 | A Pointer Parameter in a C Function simulates | h) | Opening a file in Read mode , retaining the previous content |
| 3.9 | A Linked List represents | i) | A white space character. |
| 3.10 | In C fopen "w" mode is used | j) | 4 Bytes |
| | | k) | A '\0' Charcter |
| | | l) | A dynamic Data Structure |

m) Using switch – case statement

n) Can be achieved by break statement

**6.    Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:**

| (a) Dividing | (b) One or ZERO | (c) CPU Register | (d) extern |
|---|---|---|---|
| (e) Optional | (f) Randomly | (g) At least once | (h At run time |
| (i) Linked List | (j) An Array | (k) Fields | |

4.1    The Operator I_Value >> 2  is equivalent to _____ I_Value by 4 .

4.2    The Declaration reg int IReg_C will allocate a _____ for the variable IReg_C.

4.3    On executing f = ! (K  >10 ) f will have a value _____

4.4    The individual Elements of any Array can be accessed _____

4.5    The else portion of an if else statement in c is  _____

4.6    In C the body of do-while loop will be executed _____

4.7    Any variable starting with _____ in the declaration will be treated as an External variable

4.8    In C a polynomial  of the form 100 M 34 – 20M + 10 can be efficiently represented by a _____

4.9    The Components of a Records are termed as _____

4.10   In C any dynamic data structure is created _____ .

## PART  TWO
### (Answer ANY FOUR questions)

**5.**    Consider the following C program Outline that DOES NOT USE any Structured Data Type like ARRAY or STRUCTURE or POINTER whatsoever ANYWHERE :

```
#include  <stdio.h>
#include  <math.h>

/*  NO  OTHER  LIBRARY  CAN  BE  USED*/

#define  CI_Max  9999
#define  CI_Min  -9999
/* NO OTHER USER DEFINED CONSTANTS, DATA TYPES OR GLOBALS
CAN  BE USED*/
/* User Defined Function Prototypes. NO OTHER FUNCTIONS are used */
void VF_Read_Int ( int, int, int*); /* READS and Returns an Integer through
it's pointer parameter provided it lies between a specific range passed as the
other two parameters . If the value read in within the   happens to be
OUTSIDE this range, it will continue to   loop & print the message   Input
OUT  of range ,
```

 Give   Again  and wait for a proper value to be inputted by the user. */

int IF_Test_Prime (int) ; /* Used to Test MOST EFFICIENTLY whether the Integer passed as it's only parameter happens to be Prime or Not. It Returns 1 if the passed Integer is prime returns 0 if it is Non Prime. In each case , it prints an appropriate message within it */

int main ()
{//begin main int I_Value;
/* You May Employ other Simple Variables */ VF_Read_Int (CI_Max, CI_Min, &I_Value);
/* Reads in an Integer Value within a Specified Range */
VF_Print_NON_Prime_Factors (I_Value);
/* Displays all the NON Prime Factors of the value I_Value*/
return(0);
}//end main

   a.    Frame the body of the function

         VF_Read_Int

         . The Function heading is as illustrated below :

         void VF_Read_Int (int I_High, int I_Low, int *PI_X)
         /*   READS and Returns an Integer through it's pointer parameter
         provided it lies between a specific range passed as the other two
         parameters . If the value read in within the  happens to be OUTSIDE
         this range, it will continue to  loop print the message {\bf Input OUT of
         range , Give    Again   and wait for a proper value to be inputted by
         the user. NO OTHER PARAMETER CAN BE USED. */
         b. Frame the body of the function

         IF_Test_Prime
         . The Function heading is as illustrated below :

         int IF_Test_Prime ( int I_Num) /* Used to Test MOST EFFICIENTLY
         whether the Integer passed as it's only parameter happens to be prime
         or Not. It Returns 1 if the passed Integer is prime returns 0 if it is
         Non Prime. In each case , it prints an appropriate message within it */

**(6+9)**

**6.**    Consider two  integer data files F1 and F2 having  following features.

   a.    Number of data values (key)  in each file is unknown and the files may be
         of different sizes.
   b.    The values / Integer Keys  in both  the files F1 & F2 are Sorted in
         Descending Order.
   c.    Same data ( key)  can appear more than once in F1 or F2.
   d.     F1  and F2 may share common data values i.e. same key item may appear
         both the files .

 Write a C function to merge the two files F1 and F2 to form a third  file F3 having the following features.

         -Elements in F3 are sorted in ascending order.

- Duplicate entries are not permitted (i. e. ,No element appears more than once).

**(15)**

**7.** The following operations are defined on a sorted Doubly linked list of Integers L where elements are arranged in Descending order from left.

INSERT (L,X) : Insert the integer X in the list L if X is not present.

DELETE (L,X) : Delete the integer X from the list L (if it exists).

SHOW-MID (L)  : Print the n/2 th element of the list from left where n is the Number of elements in the current list and we use integer Division where 5/2 = 2

Frame C functions to implement each of the above functions INSERT (L,X) , DELETE (L,X) and SHOW_MID( L)

**(6+6+3)**

**8.**

a. In 2 (two) dimensions, a point can be described by its two coordinates namely X & Y both of which can be real numbers. A line can be described in the following manner :

(i) The co-ordinates of its two end points  (X1, Y1) & ( X2, Y2 )
(ii) Its gradient 'm' & intersection 'c' (in  the form $Y = mx + c$)
(iii) The length of the line is also stored along with.

Specify appropriate data types to store a point as well as a line in C.

**(1+2)**

b. Write a C function Point_to_Line (P1, P2) that will accept as parameters the coordinates of two points P1 & P2 and return a line that has the aforesaid 2 points as its end points.

**(5)**

c. A quadrilateral can be described by a sequence of 4(four) lines such that one end point of one line happens to be the starting point of the next line. Specify a suitable data structure in C to represent a quadrilateral.

**(2)**

d. Write a C function that will accept a quadrilateral as a parameter and classify it whether it is a
[2+2+3=7]
A Square.
A Rhombus.
A Rectangle.

in each case it computes the perimeter as well.

**(2+2+3)**

**9.**

a.  Write a single Recursive C function to generate the n th Fibonacci number Fib(n) ( n being a +ve non zero integer ) . You cannot use any array, global variables and/or additional parameters/functions. Trace out the Call & Return sequences along with return values clearly by a schematic diagram when your function Fib(n) is invoked from main() with n = 6. Also mention the TOTAL no. of times any Fib(n) is called for each value of n for invoking Fib(6) from main(), e.g. Fib(2) is called a total of 4 times etc.

**(2+5+2)**

b.  What will be the value of A(1, 3) if A(m, n) happens to be defined in the following manner? Specify each computation step in detail .

$A(0, n) = n + 1$ for $n \geq 0$
$A(m, 0) = A(m - 1, 1)$ for $m > 0$
$A(m, n) = A(m - 1, A(m, n - 1))$ for $m, n > 0$

**(6)**

# A3-R4: PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

**Assignment 1.**

Write a program to find sum of all prime numbers between 100 and 500.

**Assignment 2.**

Write a program to obtain sum of the first 10 terms of the following series for any positive integer value of X :

$$X + X^3/3! + X^5/5! ! + X^7/7! + \dots$$

**Assignment 3.**

Write a program to reverse the digits of a given number. For example, the number 9876 should be returned as 6789.

**Assignment 4.**

Write a program to compute the wages of a daily laborer as per the following rules :-

| Hours Worked | Rate Applicable |
|---|---|
| Upto first 8 hrs | Rs 50/- |
| For next 4 hrs | Rs 10/- per hr extra |
| For next 4 hrs | Rs 20/- per hr extra |
| For next 4 hrs | Rs 25/- per hr extra |
| For rest | Rs 40/- per hr extra |

Accept the name of the laborer and no. of hours worked. Calculate and display the wages. The program should run for N number of laborers as specified by the user.

**Assignment 5.**

Write a program to input 20 arbitrary numbers in one-dimensional array. Calculate Frequency of each number. Print the number and its frequency in a tabular form.

**Assignment 6**.

Define 2 dimensional array a (3,3), b(3,3),sum(3,3),diff(3,3),mult(3,3). Store 9 arbitrary numbers in a(3,3) and 9 arbitrary numbers in b(3,3). Do the following:

a) Calculate sum of a(3,3) and b(3,3) and store in sum(3,3) where sum(i,j)=a(i,j)+b(i,j)
b) Calculate difference of a(3,3) and b(3,3) and store in diff(3,3) where diff(i,j)=a(i,j)-b(i,j)
c) Calculate product of two arrays a(3,3) and b(3,3) and store in mult(3,3) where mult(i,j)= summation of a(i,k)*b(k,j) over k where k=1 to 3.

Print the result in a tabular form

**Assignment 7.**

Write a function, str_search(char* s1,char* s2, int n) , that takes two strings and an integer, as arguments and returns a pointer to the $n^{th}$ occurrence of $1^{st}$ string s1 in $2^{nd}$ string s2, or NULL if it is not present.

**Assignment 8**.

Write a C function to remove duplicates from an ordered array. For example, if input array contains 10,10,10,30,40,40,50,80,80,100 then output should be 10,30,40,50,80,100.

**Assignment 9.**

Apply recursive call to do the following:
      (i)   Input 'n'(1-200). Calculate sum of 'n' numbers.
      (ii)  Input 'n'(1-20). Calculate product of 'n' numbers.
      (iii) Input 'n'(2-20). Print 'n' number of Fibonacci numbers.  In Fibonacci sequence the sum of two successive terms gives the third term. The following are few terms of Fibonacci sequence :-

1     1     2     3     5     8     13    ………

**Assignment 10.**

Write a program which will arrange the positive and negative numbers in a one-dimensional array in such a way that all positive numbers should come first and then all the negative numbers will come without changing original sequence of the numbers.
    Example:
    Original array contains: 10,-15,1,3,-2,0,-2,-3,2,-9
         Modified array: 10,1,3,0,2,-15,-2,-2,-3,-9

**Assignment 11**.

Write a menu driven program to maintain a Telephone Directory having following file structure:
      1. Name :    Character type : Length =20 characters.
      2. Address :  Character type : Length =40 characters.
      3. Phone:    Character type : Length =12 characters.

          Menu
          1. Add record(s)
          2. Display record(s)
          3. Search record(s)
          4. Modify record(s)
          5. Delete record(s)
          6. Backup copy of File
          7. Exit
Type your choice= 1,2,3,4,5,6,7— ->

**Assignment 12**.

Write a program to extract words form any text file and store in another file. Sort the words in alphabetical order and store them in the same file. Read the sorted file and print the frequency of each word.

**Assignment 13**.

Write a program to remove all occurrences of word "the" and "The" from an input string. For example

Input : The Dhillon Theatre is now the Fun Republic.
Output : Dhillon  atre is now Fun Republic.

**Assignment 14**.

Write a program to display the Following pattern called Floyed's Triangle.

```
 1
 2   3
 4   5   6
 7   8   9   10
11  12  13  14  15
```

**Assignment 15.**

Write a program that accepts an input integer 'n' in the range 3-9 inclusive, and display the following pattern on a cleared screen.

```
Sample input for n=3                    Sample input for n=4
 Sample output                           Sample output
     3                                       4
    3 2 3                                    4 3 4
   3 2 1 2 3                                4 3 2 3 4
    3 2 3                                  4 3 2 1 2 3 4
     3                                      4 3 2 3 4
                                             4 3 4
                                              4
```

**Assignment 16**.

Write a program to count the vowels in free text given as standard input. Read text one character at a time until you encounter end-of-data. Then print out the number of occurrences of each of these vowels.

**Assignment 17**.

Write a program to copy one file to another such that every word is reversed before being written to the target file. Assume the maximum size of each word is 10 characters and each word is separated either by new line(s), tab(s)  or space(s). For example, if source file contains "I am an Indian", the target file should contain "I ma na naidnI".

**Assignment 18.**

Define a structure for an Employee having EmployeeName, EmployeeCode, BasicPay, DearnessAllowance, HRA, PF, GrossPay, NetPay Take an array of 10 Employees. Write 'C' functions to :-

     a) Accept data for EmployeeName, EmployeeCode, BasicPay for all the employees.
     b) Compute :-
          a. DearnessAllowance = 50% of BasicPay
          b. HRA = 20% of BasicPay + DearnessAllowance
          c. PF = 12% of BasicPay + DearnessAllowance
          d. GrossPay = BasicPay + DearnessAllowance + HRA
          e. NetPay = GrossPay – PF
     c) Display the name of employee who has highest GrossPay.
     d) Compute and display average net pay.
     e) Display list of all employees in the alphabetical order of employee name.

**Assignment 19.**

Write a program to convert a given decimal number to its binary equivalent and vice versa.

**Assignment 20**.

Input any positive integer number (n<=9999999). Convert the number into words.

**Assignment 21**.

     a) Define a structure of a node of a linked list having an integer data member x.
     b) Use the above structure in (a) and write the functions for the following parts;

     i)      a function which takes a pointer to the head of linked list, which is in ascending order and an integer, x to be inserted in the linked list, as arguments. The node must be inserted in such a way that the linked list remains in ascending order after insertion.

     ii)     a function which takes a pointer to the head of a linked list and an integer, x to be removed from the linked list, as arguments. If x is not found in the linked list, then it should display an appropriate message.

**Assignment 22.**

Write a program to replace 'a' with 'b', 'b' with 'c',….,'z' with 'a' and similarly for 'A' with 'B','B' with 'C', …., 'Z' with 'A' in a file. The other characters should remain unchanged.

**Assignment 23**.

Write a function char* stuff(char* s1,char* s2,int sp, int rp) to stuff string s2 in string s1 at position sp, replacing rp number of characters (rp may be zero).

**Assignment 24**.

Write a program to display the content of a Text file which means it will behave like TYPE command of MSDOS. Suppose the name of your program file: FILETYPE.C and

FILETYPE.EXE and the name of the source file is MYFILE.TXT. The following command should work: C: \PROGRAM> FILETYPE   MYFILE.TXT

**Assignment 25**.

Write a program to input name, address and telephone number of 'n' persons (n<=20). Sort according to the name as a primary key and address as the secondary key. Print the sorted telephone directory.

# A4-R4: COMPUTER SYSTEM ARCHITECTURE

## Objective of the Course

Objective of the course is to familiarize students about hardware design including logic design, basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. This subject mainly focuses on the computer hardware and system software. It aims to describe the following aspects—

- Building blocks of the computer
- Computer Design
- Assembly Language Programming

## Outline of Course

| S. No. | Topic | Minimum number of hours |
|---|---|---|
| 1. | Digital Components | 10 |
| 2. | Data Representation | 04 |
| 3. | Register Transfer & Micro Operations | 04 |
| 4. | Basic Computer Organization | 04 |
| 5. | Central Processing Unit | 08 |
| 6. | Computer Arithmetic | 06 |
| 7. | Input-Output Organization | 08 |
| 8. | Memory Organization | 08 |
| 9. | Assembly Language Programming | 08 |

| | | | |
|---|---|---|---|
| **Lectures** | **=** | **60** | |
| **Practical/tutorials** | **=** | **60** | |
| **Total** | **=** | **120** | |

## Detailed Syllabus

**1. Digital Components**                                                                 **10 Hrs.**
Overview of computer organization: Logic gates, Adders, Flip-flops (as 1 bit memory device), Encoders, Decoders, Multiplexers, Registers, Shift Registers, Counters, RAM, ROM

**2. Data Representation**                                                                 **04 Hrs.**
Number system, Hexadecimal numbers, ASCII code, Two's complement, addition, subtraction, overflow, Floating point representation

**3. Register Transfer & Micro Operations**                                         **04 Hrs.**
Bus and memory transfers, Three state Bus Buffers, Binary ADDER, Binary Incrementer, Arithmetic circuit, Logic and Shift Micro-operations, ALU

**4. Basic Computer Organization**                                                     **04 Hrs.**
Instruction codes, Direct and indirect address, Timing and Control Signal generation, Instruction Cycle, Memory Reference Instructions, Input Output instructions.
.

### 5. Central Processing Unit                                      08 Hrs.

General Register Organization, Memory Stack, One address and two address Instructions, Data transfer, arithmetic, logical and shift instructions, Software and hardware interrupts (only brief introduction), Arithmetic and Instruction Pipelines.

### 6. Computer Arithmetic                                          06 Hrs.

Addition and Subtraction with signed magnitude data, Multiplication Algorithms Hardware Algorithm and Booth Algorithm, Division Algorithm

### 7. Input-Output Organization                                    08 Hrs.

Asynchronous Data transfer - Handshaking, Asynchronous Serial Transfer, Interrupt Initiated I/O, DMA transfer, Interfacing Peripherals with CPU (Introduction), Keyboard, Mouse, Printer, Scanner, Network card, Introduction to Pipelining and Linear Pipeline processor

### 8. Memory Organization                                          08 Hrs.

ROM, RAM, Hard Disk, CD-ROM, Cache Memory - Direct mapping scheme, Virtual Memory concept, Cache memory working principles

### 9. Assembly Language Programming                                 08 hrs.

Assembly Language of Intel 8086, Simple examples based on arithmetic and character operations.

**Note: For assembly language programming Turbo Assembler may be used.**

**RECOMMENDED BOOKS**

**MAIN READING**

1. Carter Nicholas, "Computer Architecture", Schaun outline Sevies , Tata McGraw-Hill, 2008.
2. M. Morris  Mano, "Computer System Architecture",  Pearson Education, 2008.
3. Peter Abel and N. Nizamuddin, "IBM PC Assembly Language and Programming", Pearson Education, 2009.

**SUPPLEMENTARY READING**

1. J.P. Hayes, "Computer Architecture & Organization", Tata  McGraw Hill
2. Michael J. Flynn, "Computer Architecture: Pipelined and Parallel Processor Design", Narosa Publishing House, 2002.

# A4-R4 : COMPUTER SYSTEM ARCHITECTURE

## Model Question Paper

**Note:**

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

**TOTAL TIME: 3 HOURS**                                              **TOTAL MARKS:  100**
                                                                     **(PART ONE – 40; PART TWO – 60)**

## PART ONE
### (Answer ALL Questions; each question carries ONE mark)

**1.** **Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1 The Toggle flip-flop can be constructed using JK flip-flop by connecting
  a) Toggle input to J and inverted form of Toggle input to K
  b) The Toggle input to J
  c) Inverted form of Toggle input to K
  d) None of these

1.2 One bit Full adder can be designed using
  a) Two half adder and one OR gate
  b) Two Half adder
  c) One EX-OR and two NAND gates
  d) None of these

1.3 In most of the digital computers, arithmetic operation of multiply is implemented with
  a) Sequence of add micro-operations only
  b) Sequence of shift micro-operations only
  c) Sequence of add and shift micro-operations
  d) None of these

1.4 The most common type flip-flop to synchronize the  state  change during clock pulse transition is
  a) JK flip-flop
  b) Edge triggered flip-flop
  c) SR flip-flop
  d) None of these

1.5 Two references to memory to fetch an operand are needed in

a) Indirect address instructions
b) Direct address instructions
c) Immediate instructions
d) None of these

1.6 Implied Accumulator (AC) register for all data manipulation is used in
a) Two-address instruction
b) Zero-address instruction
c) One-address instruction
d) None of these

1.7 Program Counter register holds
a) The instruction to be executed next
b) The address of next instruction to be executed
c) The count of the programs running in the system
d) None of these

1.8 DMA controller transfers one data word at a time in
a) Cycle stealing
b) Burst transfer
c) Synchronous transfer
d) None of these

1.9 Cache memory is used to keep
a) Very frequently used data in organization
b) Keep image of main memory
c) Compensate for the speed differential between main memory access time and processor logic
d) None of these

1.10 Segment register CS contains 1F00h and IP contains 0300h, the absolute address of the instruction 1F00:0300 is
a) 1F300h
b) 2200h
c) 1F30h
d) None of these

**2. Each statement below either TRUE or FALSE. Identify and mark them accordingly in the answer book**

2.1 A 4 to 1 multiplexer can be designed with the help of four AND gates and one OR gate.
2.2 Hardware procedure for programming ROM or PROM is irreversible.
2.3 Addition of two opposite signed numbers may cause overflow.
2.4 Three-state gates do not perform all conventional logic such as AND or NAND.
2.5 An n-bit binary adder requires (n-1) full adder.
2.6 Address in instruction may contain the address of the address of the operand.
2.7 The conversion from infix notation to reverse Polish notation must take into consideration the operational hierarchy adopted for infix notation.
2.8 In asynchronous data transfer between two independent units require that control signals be transmitted between communicating units to indicate the time at which

data is being transmitted.
2.9    ROM is also random access memory.
2.10   An assembly program may have maximum size of 256KB.

## 3. Match words and phrases in column X with the nearest in meaning in column Y.

| | | | |
|---|---|---|---|
| 3.1 | Using flip-flop with complementing capabilities | a. | Counter circuit |
| 3.2 | Single processor register | b. | Accumulator |
| 3.3 | Carry into sign bit and carry out of sign bit | c. | Overflow |
| 3.4 | Data in operand | d. | Immediate addressing |
| 3.5 | Control signal accompanying each data item | e. | Handshaking |
| 3.6 | Mechanism for translating program generated addresses into correct main memory locations | f. | Virtual memory |
| 3.7 | Addition of three bits (two significant bits and a previous carry) | g. | Full adder |
| 3.8 | Rules for interpreting or modifying the address field of instruction before operand is actually referenced | h. | Addressing modes |
| 3.9 | Rate at which serial information is transmitted | i. | Baud rate |
| 3.10 | Holding high 16 bits of the product in multiplication operation of assembly language | j. | DX |
| | | k. | BX |
| | | l. | Half adder |
| | | m. | Strobe |
| | | n. | Direct addressing |
| | | o. | Undefined |

## 4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in list below

| | | | | | |
|---|---|---|---|---|---|
| (a) | ROM | (b) | Multiplex | (c) | Normalized |
| (d) | Indirect | (e) | Micro-programmed | (f) | One |
| (g) | Hardwired | (h) | Multiply | (i) | Pipelining |
| (j) | CX | (k) | RAM | (l) | Counter |
| (m) | Immediate | (n) | Macro-programmed | (o) | Add |
| (p) | DX | | | | |

4.1    ---------- does not need a read-control line.
4.2    ---------- is a combinatorial circuit, which receives binary information for one of $2^n$ input data lines and directs it to a single output line.
4.3    A floating point number is said to be ---------- if the most significant digit of the mantissa is non-zero.
4.4    One bit of instruction code can be used to distinguish between direct addressing and ---------- addressing.
4.5    A control unit which utilizes a ROM to store binary control information is called a

---------- control unit.

4.6     The computer needs only ---------- common hardware circuit to handle addition of signed and unsigned number.

4.7     In ---------- organization the control logic is implemented with gates, flip-flop, decoders and other digital circuits.

4.8     Booth algorithm gives a procedure to ---------- binary integers in signed – 2's complement representation.

4.9     ---------- is a technique of decomposing a sequential process into sub-operations, with each sub-process being executed in a special dedicated segment which operates concurrently with all other segments.

4.10    ---------- register acts as counter for repeating and looping the assembly instructions.

## PART TWO
## (Answer ALL questions)

**5.**

    a.  Simplify the following Boolean functions by means sum-of-product form of a three variable map. Draw the logic diagram with

        i.      AND – OR gates

        ii.     NAND gates

$$F(A, B,C ) = \sum (0, 2, 4, 5, 6 )$$

    b.  Explain how JK Flip-flop can be realized from RS flip-flap?

    c.  How many 128 x 8 memory chips are needed to provide a memory capacity of 4096 x 16 ?

**( 9 + 3 + 3 )**

**6.**

    a.  Draw and explain a 4 bit adder-subtractor circuit.

    b.  Explain direct and indirect address instructions and immediate instructions with suitable examples.

    c.  Explain the basic computer instruction format. When do you call the set of instructions to be complete? Why are set of instructions for basic computer, which is complete, is not efficient?

**( 4 + 6 + 5 )**

**7.**

    a.  What are differences between zero-address, one-address and two-address instructions? Explain these through examples.

    b.  What is Booth algorithm? Explain it through flow chart along with an example.

    c.  What is asynchronous data transfer? What are strobe pulse method and handshaking method of asynchronous data transfer? Explain them.

**( 6 + 5 + 5 )**

**8.**

    a.  What is virtual memory? How is it implemented?

    b.  An address space is specified by 24 bits and corresponding memory space by 16 bits.

        i.      How many words are there in the address space?

        ii.     How many words are there in the memory space?

        iii.    If page consists of 2k words, how many pages and blocks are there in the system?

    c.  For what purpose the segment registers are used and how many are there In Intel 8086? How are effective address is calculated in Intel 8086 assembly

language?

d. Write an assembly language program to find the least and greatest number among the given twenty numbers (consecutively stored as words) at location **NUM** and put the results at **LEAST** and **GREATEST** locations (defined as words).

**( 3 + 4 + 3 + 5 )**

# A4-R4: COMPUTER SYSTEM ARCHITECTURE

**Assignment 1.**

Design an AND gate and an EX-OR gate using NAND gates.

**Assignment 2.**

Solve the following K-Map for the given equation:
$$F (a,b,c,d)= \Sigma(0,1,4,5,7,9,10,11,14,15)$$
And draw the equivalent digital circuit diagram for the same.

**Assignment 3.**

Solve the following K-Map for the given equation:
$$F (p,q,r,s)= \Pi (0,1,3,5,7,9,11,13,15)$$
And draw the equivalent digital circuit diagram for the same.

**Assignment 4.**

Prove the following Boolean algebra identities:
  a) $(A+B).(A+C)=A+B.C$
  b) $A+A.B=A$
  c) $(A+B'+A.B)(A+B')(A'.B)=0$
  d) $A+A'.B=A+B$

**Assignment 5.**

Given the Boolean function
$$F= p.q.r + p'.q' + q'.r + p.r$$

  a) Simplify the Boolean expression using K-Maps.
  b) Draw the logic diagram using the given Boolean expression.
  c) List the truth table of the function.

**Assignment 6.**

Given the Boolean function
$$F= a'.b' + a'.d.c' + b.c.d'$$

  a) List the truth table of the function.
  b) Draw the logic diagram using the given Boolean expression.
  c) Simplify the Boolean expression using Boolean Algebra Identities.
  d) Draw the logic diagram using the simplified Boolean expression and compare with part 3.
  e) Check whether the truth table of part 2 and of part 3 is identical.

**Assignment 7.**

Represent the decimal number 1849 in
  a) BCD,

b) Excess-3 code,
c) 5421 code,
d) as a binary number,
e) equivalent Grey code of binary number.

## Assignment 8.

A majority function is generated in a combinational circuit the output is equal to 1 if the input variables have 2 or more consecutive 1's appearing together, the output is 0 otherwise. Design the equivalent combinational circuit.

## Assignment 9.

Design a combinational circuit with three inputs P, Q, R and three outputs a, b, c. When the input is 0 or 1 in decimal the binary output is one greater than the input. When the input is 6 or 7 in decimal, the binary output is one less than the input. Otherwise the binary output is zero.

## Assignment 10.

A circuit has four inputs and two outputs. One of the outputs is high when the majority inputs are high. The second is high only when all inputs are of same type. Design the combinational circuit.

## Assignment 11.

Draw the state diagram and tabulate the state table for a sequential circuit with two flip-flops and one external input x. When x=1, the state of the flip-flops does not change. When x=0 the state sequence is 00,11,10 01, 00 and repeat.

## Assignment 12.

For the given state diagram given in the figure
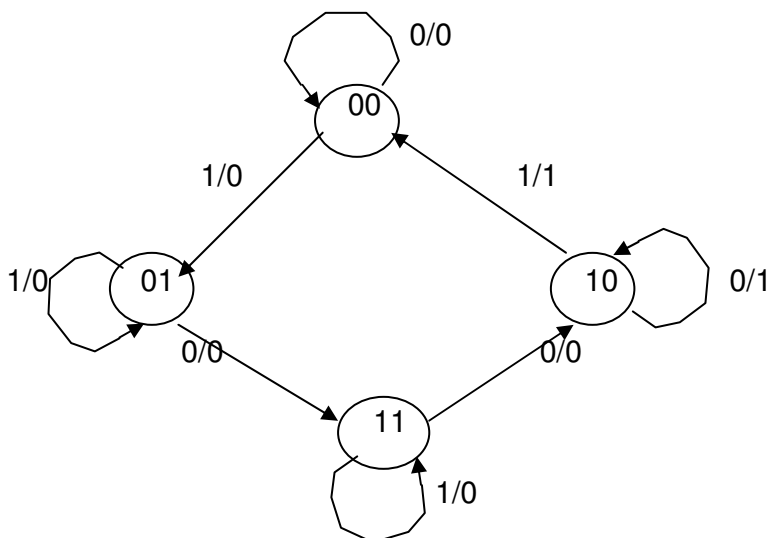


Draw the clocked sequential circuit using 2 T-Flip flops.

## Assignment 13.

Construct a 6-to-64-line decoder with two 5-to-32-line decoders with enable and one 1-to-2-line decoder.

## Assignment 14.

How many address line and data lines would be required for the memories of the following capacities:

a) 16K×8
b) 256K×16
c) 128M×16
d) 32G×32
e) 128G×8

Where K refers to Kilobyte, M refers to MegaByte and G refers to GigaByte.

## Assignment 15.

How many 256×16 memory chips are needed to provide a memory capacity of 8192×16?

## Assignment 16.

A computer needs 2048 bytes of RAM and 2048 bytes of ROM. The RAM and ROM chips to be used are specified in the problem. The RAM chip size is 256×8 and the ROM chip size is 2048×8. List the memory address map and indicate what size decoders are needed.

## Assignment 17.

Perform the arithmetic operations arithmetic operations below with binary numbers using signed 2's complement representation wherever required. Use eight bits to accommodate each number together with its sign.

a) (+12) + (+56)
b) (-35) + (- 49)
c) (-85) – (+71)
d) (-109) + (-11)

## Assignment 18.

Let Q be a register of eight bits having an initial value of Q=11011101, determine the sequence of binary values in Q after a arithmetic logical shift-left, followed by a circular shift-right, followed by a arithmetic logical shift-right and circular shift-left.

## Assignment 19.

Divide $(448)_{10}$ with $(17)_{10}$ using the division algorithm.

## Assignment 20.

Multiply $(-5)_{10}$ with $(-19)_{10}$ using the Booth's multiplication algorithm.

## Assignment 21.

Write a program in assembly language that will reverse an array of N   words.

**Assignment 22.**

Write a program in Assembly language that will accept hexadecimal input of numbers and display the equivalent hexadecimal number entered in the output.

**Assignment 23.**

Prompt the user to enter a line of text. On the next line, display the capital letter entered that comes first alphabetically and the one that comes last. If no capital letters are enterd display message, "No Capital Letters". The result should look like this on the screen:

```
Type a line of text:
THE QUICK BROWN FOX JUMPED
First capital=B
Last Capital=X
```

Write a program in Assembly language to perform the above-mentioned task.

**Assignment 24.**

Write a program in Assembly language that will read a character from the keyboard and display the character in the next line.

**Assignment 25.**

Write a program in assembly language that will count the number of vowels and consonants in the string that has been entered.

# A5-R4: STRUCTURED SYSTEM ANALYSIS AND DESIGN

## Objective of the Course

The Objective of the course is to provide the necessary skills, learning and exposure in developing an information system. The student should be able to develop an understanding of the general principles and purpose of systems analysis and design; apply key techniques from a standard methodology. He should have knowledge of information systems and be able to prepare the physical design of an information system.

The course focuses on the following aspects of Information System Development:

- Study, Analysis and Design of a System
- Documenting and evaluating the system
- Data Modeling
- Developing Information Management System for an Organization
- Implementing, Testing and Security Aspects

## Outline of Course

| S. No. | Topic | Minimum number of hours |
|--------|-------|:-----------------------:|
| 1. | Introduction | 03 |
| 2. | System Development Cycle | 03 |
| 3. | System Planning | 06 |
| 4. | Modular and Structured Design | 02 |
| 5. | System Design and Modeling | 14 |
| 6. | Input/Output and Interface Design | 07 |
| 7. | System Implementation and Maintenance | 03 |
| 8. | Computer System Security | 02 |
| 9. | OO Analysis/Design | 12 |
| 10. | Introduction to Management Information System | 08 |

| | | |
|---|:---:|:---:|
| **Lectures** | = | **60** |
| **Practical/tutorials** | = | **60** |
| **Total** | = | **120** |

## Detailed Syllabus

### 1. Introduction                                                                      03 Hrs.

System Definition and concepts: General Theory systems, Manual and automated systems, Real-life Business Sub-Systems. System Environments and Boundaries, Real-time and distributed systems, Basic principles of successful systems, Approach to system development: Structured System Analysis and Design, Prototype, Joint Application Development, Role and Need of Systems Analyst. Qualifications and responsibilities, System Analysis as a Profession.

## 2. System Development Cycle                                          03 Hrs.
Introduction to Systems, Development Life Cycle (SDLC). Various phases of SDLC: Study Analysis, Design, Development, Implementation, Maintenance; Documentation: Principles of Systems Documentation, Types of documentation and their importance, Enforcing documentation discipline in an organization

## 3. System Planning                                                   06 Hrs.
Data and fact gathering techniques: Interviews, Group Communication -Questionnaires; Assessing Project Feasibility: Technical, Operational, Economic, Cost Benefits Analysis, Schedule, Legal and contractual, Political. Modern Methods for determining system requirements: Joint Application, Development Program, Prototyping, Business Process Re-engineering. System Selection Plan and Proposal

## 4. Modular and Structured Design                                      02 Hrs.
Module specifications, Top-down and bottom-up design. Module coupling and cohesion. Structure Charts.

## 5. System Design and Modeling                                         14 Hrs.
Process Modeling, Logical and physical design, Conceptual Data Modeling: Entity /Relationship Analysis, Entity-Relationship Modeling, ERDs and DFDs, Concepts of Normalization. Process Description: Structured English, Decision Tree, Table; Documentation: Data Dictionary, Recording Data Descriptions.

## 6. Input/Output and Interface Design                                  07 Hrs.
Classification of forms, Input/output forms design. User-interface design, Graphical interfaces. Standards and guidelines for GUI design, Designing Physical Files and Databases: Designing Fields, Designing Physical Records, Designing Physical Files, Designing Databases, Introduction to CASE Tools; Features, Advantages and Limitations of CASE Tools, Awareness about some commercial CASE Tools.

## 7. System Implementation and Maintenance                              03 Hrs.
Planning considerations, Conversion methods, procedures and controls, System acceptance criteria, System Evaluation and Performance, Testing and Validation. Preparing, User Manual, Maintenance Activities and Issues.

## 8. Computer System Security                                           02 Hrs.
Security aspects of a Computer System; Control Measures; Disaster Recovery and Contingency Planning, Prevention of Computer Virus & Malicious Applications.

## 9. OO Analysis / Design                                               12 Hrs.
OO Development Life Cycle and Modeling. Static and dynamic modeling. Comparison of OO and Module-oriented Approach. Modeling using UML ; The UML diagrams; the process of Object modeling

## 10. Introduction to Management Information System (MIS)               08 Hrs.
Meaning and role of MIS, Systems approach to MIS. Types of information systems : Transaction Processing System, Management Information System, Decision Support System, Expert System Case Studies (Illustrative) : MIS for Accounting and Finance Function, MIS for Marketing System.

**RECOMMENDED BOOKS**

**MAIN READING**

1.  Hoffer J. A, George J.F, Valacich J.S, and Panigrahi P.K "Modern Systems Analysis and Design", Pearson Education, 2007.
2.  A. Dennis and B. H. Wixom, "Systems Analysis and Design", John Wiley & Sons, Inc.

**SUPPLEMENTARY READING**

1.  Whitten J. L, Bentley L. D, "Systems Analysis and Design Methods",  Tata McGraw-Hill, 2008.
2.  Kendall & Kendall, "Systems Analysis and Design", Seventh Edition, Pearson Education.

## Model Question Paper

**NOTE:**

| | |
|---|---|
| 1. | There are **TWO PARTS** in this Module/Paper.  **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions. |
| 2. | **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein.  **PART ONE** is **NOT** to be answered in the answer book. |
| 3. | Maximum time allotted for **PART ONE** is **ONE HOUR**.  Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned.  However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**. |

**TOTAL TIME: 3 HOURS**                                  **TOTAL MARKS: 100**
                                                              **(PART ONE: 40; PART TWO: 60)**

## PART ONE
### (Answer all the questions; each question carries ONE mark)

1.      **Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1     A starting point in the hardware design phase of a system design project is
        A.  The determination of size and capacity requirements for the hardware
        B.  Preparation of a purchase contract
        C.  Calling quotations from hardware vendors
        D.  Benchmarking

1.2     Software maintenance includes

        A.  Bug fixing
        B.  Setting preventive maintenance policy for the servers and clients in the
             computer network
        C.  Simulation of proposed changes in organizational strategy
        D.  Feasibility study

1.3     The role of an integrated CASE tool in a systems analysis and design project is
        A.  To provide automatic help in case of legal cases when there is a dispute
             between developer and user
        B.  To serve as a less expensive substitute for spreadsheet during the
             negotiation process
        C.  To provide an environment that automates key tasks throughout the
             entire development process
        D.  To serve as a sophisticated text editor

1.4     In the processing of a data dictionary, cross reference checking means
        A.  Linking of documents through hypertext, in case the system deals with
             document imaging

B. Ensuring that there is no inconsistency between the way a reference is quoted in a text file, and the reference is listed in a reference file
C. Determination of where data are used in the system, i.e., which processes use a given data item, which data items are unused.
D. Verifying whether the latest updates are reflected in different components of a system

1.5 Cost of error correction is least at
A. Requirement Analysis stage
B. Design stage
C. Development stage
D. Implementation stage

1.6 A sequential access file is not a file
A. In which the last record is retrieved in the same time as the first record
B. In which a record cannot be accessed unless its predecessor records are accessed
C. Usually stored on magnetic tape
D. In which to insert a record, a new copy of the file is created

1.7 The difference between menu interface and question-answer dialogue is
A. In the former, the user fills in a form, whereas in the latter, the user
B. In the former, the user uses a light pen, whereas in the uses a mouse
C. The former is popular in restaurant computers whereas the latter is popular in a police department
D. In the former, the user has to choose from a given list of options, and in the latter the user has to answer questions put by the computer

1.8 The primary difference between program testing and system testing is
A. Program testing is more comprehensive than system testing
B. System testing focuses on testing the interfaces between programs, whereas program testing focuses on individual programs
C. System testing is concerned with testing all aspects of a system including job designs and reward system designs
D. Programmers have no involvement in system testing, whereas designers are involved in program testing

1.9 Which of the following is not a major design consideration for a system?
A. Response time required
B. Frequency of record updates
C. Availability of technically qualified personnel to carry out design and development
D. Data integrity constraints

1.10 The largest percentage of the total life cycle cost of software is
A. Design costs
B. Maintenance costs
C. Coding costs
D. Testing costs

**2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book.**

2.1 A data dictionary is a structured repository of data about data.
2.2 HIPO diagrams are used to develop packages.
2.3 Computer system security involves only virus protection.
2.4 Validation errors are detected by check digits.
2.5 VTOC shows a hierarchy of documents.
2.6 ERD reflects the business requirements of a proposed system.
2.7 Aliases are included in Data Dictionaries.
2.8 During the Design phase of the SDLC, input design is governed by the volume and frequency of data.
2.9 A Database Administrator is the one who designs the database for an application.
2.10 A Gantt chart represents activity or job schedules in the form of bar graphs.

**3. Match words and phrases in column X with the closest related meaning/word(s)/phrase(S) in column Y.**

| X | | Y | |
|---|---|---|---|
| 3.1 | Smart Card | A. | Record occurrences |
| 3.2 | Knowledge Base | B. | Hardware selection |
| 3.3 | Alpha Test | C. | Verification |
| 3.4 | Validation | D. | Certificate |
| 3.5 | CASE | E. | SASD tool |
| 3.6 | Action Statement | F. | Expert System |
| 3.7 | Sizing | G. | Updating prelude |
| 3.8 | Tuples | H. | Communications |
| 3.9 | Benchmark | I. | Programming |
| 3.10 | Topology | J. | Transaction Processing |

**4. Each statement below has BLANK space to fit one of the word(s) or phrase(s) in the list below. Enter your choice in the answer sheet, following instructions there in.**

| | | | | | |
|---|---|---|---|---|---|
| (a) | Balancing | (b) | Outsourcing | (c) | Unit |
| (d) | Incremental Commitment | (e) | Recurring | (f) | Relationship |
| (g) | One-time | (h) | Level-1 Diagram | (i) | Database |
| (j) | Transposition Document | (k) | Context Diagram | (l) | System |
| (m) | Turn around Document | (n) | icon | (o) | Graph |
| (p) | Equality | | | | |

4.1 A shared collection of logically related data designed to meet the information needs of multiple users in an organization is a _____.
4.2 _____ is a strategy in Systems Analysis and Design in which the project is reviewed after each phase and continuation of the project is rejustified in each of these reviews.
4.3 A _____ cost results from the ongoing evolution and use of a system.
4.4 _____ provides an overview of an organizational system.

4.5 The conservation of inputs and outputs to a DFD process when that process is decomposed to a lower level is called _____.

4.6 _____ is an association between the instances of one or more entity types that is of interest to the organization.

4.7 The practice of turning over responsibility of some to all of an organization's information systems applications and operations to an outside firm is called _____.

4.8 _____ provides information that is delivered to an external customer as an output that can be returned to provide new information as an input to an information system.

4.9 _____ is a graphical picture that represents specific functions within a system.

4.10 In _____ testing each module is tested alone in an attempt to discover any errors in its code.

## PART TWO
### (Answer any FOUR questions)

**5.**

a. What are the differences between system analysis and system design? Justify your answer with examples. What is the role of system analyst in system analysis and design?

b. What is Software Development Life Cycle (SDLC)? Describe various phases of SDLC. Briefly Explain various types of documentation involved in each phase of SDLC.

**(7+8)**

**6.**

a. What is UML? Why it is called unified modeling? List and explain various diagrams involved in modeling using UML, which shows behavioral aspects of the system.

b. Describe pros and cones of interview and questionnaires technique for requirement gathering.

c. What is a structure chart? How is it related with cohesion and coupling?

**(7+4+4)**

**7.**

a. Develop a decision tree that describes the decisions, a school attendance officer must make in fulfillment her responsibilities.

The officer spends a part of each day looking for truant students. If the officer comes upon a student who is truant, she transports the youth to the school's attendance office. The student is held at office while the attendance officer attempts to contact the parents or guardians. If the officer is able to reach the parents or guardians, the student is released into custody and a date is set for a formal review of the student's attendance record. If the officer is unable to reach the parents or guardians, the student is detained in the attendance office until the end of the school day and then released.

The system is dependent upon having up-to-date attendance records, as well as the current telephone numbers (home and work) for parents or guardians.
Whenever possible, the attendance officer will attempt to visit a truant student's parent or guardians and inform them of the problem.

However, if the officer has a large number of truancies to investigate, she sends a formal letter to the parents or guardians whom she has been unable to reach by

phone or in person. The letter informs them of their child's truancy and requests that they call or come to see the truant officer.

b. A recruitment procedure in an organization is as follows:
An advertisement is issued giving essential qualifications for the specific post, the last date for receipt of application and the fee to be enclosed with the application. A clerk in the registrar's office checks the received applications to the concerned department. The department checks the application in detail and decides the applicants to be admitted, those to be put in the waiting list and those to be rejected. Appropriate letters are sent to the registrar's office, which intimates the applicant. Give physical and logical DFDs corresponding to the above problem.

**(8+7)**

**8.**

a. What is a CASE tool?  Explain about any commercial CASE tool with its features and limitations.
b. What is the Conversion of system? Why is it required? How conversion takes place in an organization for system implementation?
c. Explain different types of threats that a computer system can have and explain various control measures for those threats.

**(5+5+5)**

**9.**

a. What is the significance of Usecase diagram in UML? At which phase of System Development it is drawn? Explain steps for preparing Usecase diagram with example.
b. Describe Object Oriented Development Life Cycle.
c. What is Object Oriented Modeling? Differentiate between Static and Dynamic Modeling.

**(7+4+4)**

# A5-R4: STRUCTURED SYSTEMS ANALYSIS AND DESIGN

## Assignment-1

The City College has a large library consisting of books of different
categories. Few are listed below:
A. Fiction       B. Biography       C. Economics D. Mathematics
E. Sports       F. Management    G. Computers and Communication
H. Taxation      I. Law           J. Travel

Students and teachers borrow the library books. The students can take at time
two books on subjects related to studies and one book from general interest.
The teachers can take at time three books on subjects related to studies and
two books from general interest. The college decides to provide an online facility
to inquire on the availability of books in the library. Entering any of the following
can search the books available in the library:
1.      By Author index (Entering first two alphabets )
2.      By title index        (Entering first two alphabets of the title of the book)
3.      By Subject index (Entering the name of the subject)

The database of the above application will be on the DBMS.
You are required to specify:
(a)   The various files required to be specified and the layout and contents of the files.
(b)   Design screen layouts for the above query. What are the checks and controls that you
      would like to incorporate in the system to ensure that erroneous input gets tapped as
      soon as it is typed.

## Assignment 2.

Activities of a school Office during admission time are as follows

Applications are received from students and they are checked for eligibility for admission.
Eligible candidates are called for an admission test. The teachers set the question
papers for the test. The candidates take up the test. The teachers evaluate the test
papers.

Based on the marks obtained by the candidate in the test and other criteria specified by the
school, the teachers prepare a provisional admission list. The candidates in the admission list
are called for an interview. Normally, this list contains about 10% more than the number of
seats available in the school.

An interview panel is constituted to interview the candidates. Taking into account the
performance of the candidates in the interview, the panel prepares a selection list. This
selection list is sent to the principal for approval.

The candidates who figure in the approved selection list are intimated about their
admission. Such candidates pay their admission and other school fees and get admitted. Proper
receipts are issued for the payment of the fees. Such admitted candidates are assigned roll
numbers and sections. Section wise attendance registers are prepared. The application forms
of these admitted students are kept in a separate file.

**Prepare the DFD representing these activities. Also give the data dictionary entries.**

**Assignment 3.**

A company stores all the purchase orders placed by it on its vendors in a purchase order file (POFILE). When it receives delivery of goods against a purchase order the details are entered in a file called RECDPOFILE (assume that partial deliveries do not exist, and that a purchase order corresponds to only one product). When an invoice is received from a vendor it is stored in the INVCEFILE. At the end of each day, a program retrieves each invoice in the INVCEFILE, checks it for the following:

    (a)   Whether the purchase order number mentioned in the invoice exists in the POFILE

    (b)   Whether the purchase order mentioned in the invoice has a corresponding entry in the RECDPOFILE.

In case a mistake is indicated in either of the above checks, a corresponding message is printed for the vendor, for later mailing; if the invoice is valid according to both the tests, then payment of invoice is authorized, and the invoice is entered in PAYFILE and a cheque is printed.

3.1 Draw a DFD for the above system

3.2 Explain the file design in detail for the above system

**Assignment 4.**

The office of Department of Computer Science organizes and handles seminars / workshops.

When a person wants to register for a seminar, he / she sends a request.
The office clerk notes the person's name, address, telephone number and organization name on a registration form. Copy of the form is placed in the master file, an acknowledgement letter prepared and sent to the registrant.
Another copy is sent to the billing clerk who creates an invoice record for the registrant in another central file and sends a copy of the invoice to the registrant.
One month before the seminar, the clerk prepares name tags and seminar material for each participant.
The registrants are expected to pay in advance of the seminar.
When a cheque comes in, the clerk verifies the registration against the registration record and enters the information that the payment has been received.
In case registrants do not sent the advance payments, their names are listed on a separate sheet. This defaulter sheet is given to the seminar coordinator who takes the appropriate action, which may be:

1.      a person is allowed to attend the seminar, if he agrees to make the payment on the first day before the seminar starts , or

2.      brings in a sanction letter from the head of the organization.

All registration records are maintained in a master file and used as a mailing list on an ongoing basis.

DESIGN A DFD FOR THE ABOVE REGISTRATION PROCEDURE FOR THE SEMINAR.

**Assignment 5.**

Below are some statements about order processing in an organization? You are required to construct an ER diagram from these statements.

**Assignment 6.**

"In many organizations, raw material inventory consumes a major portion of the assets of the business. Management of inventory is therefore an important computer application. An integrated inventory system includes an inventory subsystem, a purchase subsystem, receiving subsystem. An inventory master file is usually maintained which is updated by all the subsystems. This file is also used to create a number of outputs for each of the subsystems."

(a)     Identify some major data elements for the inventory master file.
(b)     Identify which data elements are being updated by which subsystems.
(c)     Identify some of the important o/p generated by each of the subsystems.

**Assignment 7.**

Design a system for the Warehouse Inventory System and illustrate the solution with a Structure Chart that will take in customer orders, select the item from inventory, and generate a packing slip and **invoice.**

INPUTS:
a) Customer Order from the Sales Department.
b) Shipments of Finished Goods to be put in Inventory.

OUTPUTS:
a)  Plant Order for more Finished Goods.
b)  Shipments of Finished Goods to the Customer.
c)  Invoice and Packing Slip for items shipped to Customer.
d)  Notice to Sales that items are Back Ordered.

The warehouse maintains the MASTER FILE that contains the quantities of all items in inventory. The warehouse ships all items ordered and send out invoices. If the order quantity is greater than quantity in inventory, nothing is shipped. The whole quantity is "back ordered." A Back Order notice is sent to the Sales Department and the customer by way of the Sales Department. Also a Plant Order for that item at the requested quantity is sent to the plant. No other tracking of back orders is done. If the order quantity is less than or equal to the quantity in inventory, then the items are shipped and the quantity in inventory is reduced for the items shipped. A check is then made to see if the amount left in inventory is below the minimum on-hand quantity controlled by the Sales Department. If so, the automatic reorder quantity that is dictated by the Sales Department is used to generate a Plant Order for that item so that the inventory can be replenished. The Customer Order contains all necessary information: Items, Quantities, Customer -Information (Name, Billing-Address, and Shipping-Address).

**Assignment 8**.

Design a structured chart using following information:

**Calling module :**
        Calculate student grade
**Called module:**

---

Get student's academic information
Get valid grade
Find out errors
Check for probation Period
Check for director's list

Include the required input and output couples, showing the direction and meaning.
In the same chart show check for probation as a calling module and factor a called module
EVALUATE APPRAISAL. Show input and output couples.

## Assignment 9.

Design a structured chart using following information:
    **Calling Module:**
        Calculate Word Counting
    **Called Module:**
        Get Sorted Word List
        Count Number of Different Words
        Output Count

Include the required input and output couples, showing the direction and meaning. Also factorise the 'Get Sorted Word List' as calling module and 'get word list' and 'sort' as called modules which further can be factorised. Show also the input & output couples.

## Assignment 10.

In a ABC Limited company, if the invoice paid is <5000, then no discount is offered. If the payment is made within 10 days and the payment is above 5000 but less than 10,000 , 2% discount is given. If the payment is made within 10 days and it is above 10,000, 3% discount is given. Otherwise no discount is given. Construct the limited entry decision table .

## Assignment 11.

The candidate is to be allotted the department, given the conditions
    a) If a male secures maximum marks in mathematics, allot Engineering department.
    b) if a female secures maximum marks in biology, she is allotted medical department.
    c) If a candidate secures maximum marks in English, allot English department.
    d) If a candidate secures less than 180 marks in aggregate, he/she is rejected.
    e) Rest all cases are allotted psychology department.
Based on above conditions draw a Extended Entry decision table.

## Assignment 12.

If a candidate is sharp and disciplined, take him as trainee systems analyst.
    a) If a candidate is only sharp, take him as trainee programmer
    b) If a candidate is only disciplined, take him as Trainee console operator.
    c) If a candidate is neither sharp nor disciplined, reject him.
Based on above conditions draw a decision tree & decision table .

## Assignment 13.

Draw a mixed entry decision table for calculating income tax according to the following conditions:

| Income Slab | Rate |
|---|---|
| Upto Rs. 18,000 | Nil |
| Greater than Rs.18000 but less than 25000 | 25% |
| Greater than Rs.25000 but less than 50000 | 30% |
| Greater than Rs.50000 but less than 1,00,000 | 40% |
| Above Rs. 1,00,000 | 50% |

**Assignment 14**.

Given is a data file of School Education Board for compilation of result of middle standard examination. Draw a decision table to compute the result of candidates. The pass formula is:

a)  Candidate is to be declared 'PASS' if he gets 40 or more than 40 marks in all three subjects.
b)  Candidate is to be declared 'FAIL' if he gets less than 40 marks in TWO OR MORE SUBJECTS.
c)  Result is to be declared 'REAPPEAR', if the candidate secures less than 40 marks in one subject and 40 or more than 40 marks in other two subjects.

**Assignment 15.**

Given a file whose record consists of following attributes:
Roll No.
Name
Sex code             'M' for males
                      'F' for females
Marks in English
Marks in Biology
Marks in Maths
The scheme for selection and allotment of departments is as follows:
a)  Reject the candidate, if aggregate marks are less than 180.
b)  Allot 'ENGINEERING ' department if the candidate has maximum marks in maths and sex code is 'M'.
c)  Allot 'MEDICAL' department if candidate has maximum marks in biology and sex code is 'F'.
d)  Allot 'ENGLISH' department if candidate has maximum marks in English.
e)  Allot 'PSYCHOLOGY 'department to all other selected candidates.
Use limited entry decision tree to do the final selection.

**Assignment 16**.

In Accounts Receivable systems printing of the monthly account statement is the main feature. Because of the frequency of accounts receivable invoices, customers generally expect certain information to be included on the statement. Name, address and account number details are essential as are the previous and current account balances.
 A common form lists the date, type, and amount of each transaction in the main part of the invoice. Depending on the particular account, there may be none, one, or many transactions. (Statements are always sent to customers who have a balance outstanding, even if there are no transactions for the current month).

Some systems also charge interest on the previous month's unpaid balance. Interest charged for the current month is listed separately in a special place on the statement form.

At the end of the calendar year, a separate line is often added to inform the customer of the amount of interest paid during the year because Customers want to see this information as a means of knowing how much they paid in interest, and this is also required for reporting their taxes to the Internal Revenue department. To capture a customer's attention, merchants often include a special message on the bottom of the statement form. The message may be up to , 120 characters and can be used to promote special sales, provide consumer service telephone numbers, etc. Its use is, however, optional.

a. Develop the data structure(s) needed to accommodate accounts receivable statement preparation as described above.
b.    Indicate which data items are mandatory and which are optional.

**Assignment 17**.

The sales staff of a Jewellery shop is divided into commissioned salesman and salaried salesman. A commissioned sales man receives 10% commission on every sale greater than or equal to Rs.10, 000.00; receives 5% commission on every sale greater than or equal to Rs.1, 000.00 and less than Rs. 10, 000.00 and receives 2% commission on every sale less than Rs.1, 000.00. A salaried salesperson receives a Rs.700.00 bonus for cumulative sales greater than or equal to Rs.10, 000.00; receives a Rs.50.00 bonus for cumulative sales greater than or equal to Rs.1, 000.00 and less than Rs.1, 000.00, and receives no bonus for sales less than Rs. 1, 000.00

        From the above description, develop a class diagram for the system.

**Assignment 18**.

Prepare a limited entry decision table for the following case:
A wholesaler has three commodities to sell and has three types of customers. Discount is

given as per the following procedure:

    a)  For VIP'S orders, 10% discount is given irrespective of the value of the order.
    b)  For orders more than Rs. 50,000/- agent gets a discount of 15% and the retailer gets a discount of 10%.
    c)  For orders of Rs. 20,000/- or more up to Rs. 50,000/- agent gets a discount of 12% and the retailer gets a discount of 8%.
    d)  For orders of the value less than Rs. 20,000 agent gets 8% and retailer gets 5% discount.
   The above rules do not apply to the furniture items where in a flat rate of 10% discount is admissible to all customers irrespective of the value of the order.

**Assignment 19**.

Identify the possible actions to be taken for the decision or policy for constructing decision table:
        a)  Pay no interest
        b)  Pay 5.75% quarterly interest on entire amount

c) Pay 6% quarterly interest on entire amount
d) Pay 6% monthly interest on amount up to Rs.25000
e) Pay 6.55% monthly interest on amount between Rs.25000 and Rs.50000
f) Pay 7.0% monthly interest on amount over Rs.50000

**Assignment 20.**

Simplify the following decision table:

| | Rules | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| C1 | N | Y | N | Y | N | Y | N | Y | N | Y | N | Y |
| C2 | N | N | Y | Y | N | Y | Y | N | N | Y | Y | |
| C3 | A | A | A | A | B | B | B | B | C | C | C | C |
| A1 | | X | | | | | X | | | | X | |
| A2 | X | | | | X | | | | X | | | |
| A3 | | X | | | | X | | | | | | |
| A4 | | | | X | | | | X | | X | | X |

Were you able to combine rules 3 and 7 in above problem? Why?

**Assignment 21.**

Prepare a decision tree that defines the following course grading scheme: A student may receive a final course grade of S,A, B, C or F. In deriving the student's final course grade, the instructor first determines an initial grade for the first test of student. The initial course grade is determined in the following manner.

a) A student who has scored a total of not less than 90 percent on the first test , quiz, class performance and received a score not less than 75 percent in the final test will receive an initial grade of 'S' for the course.

b) A student who has scored a total less than 90 percent but greater than 80 percent on first test quiz, class performance and received a score not less than 70 percent in final test will receive an initial grade of 'A' for the course.

c) A student who has scored a total less than 80 percent but greater than 70 percent in the first test, quiz, class performance and received a score not less than 65 percent in the final test will receive an initial grade of 'B' for the course.

d) A student who has scored a total less than 70 percent but greater than 60 percent on the first test, quiz, class performance and received a score not less than 55 percent in the final test will receive an initial grade of 'C' for the course.

e) A student who has scored a total less than 60 percent in the first test, quiz and class performance will receive an initial and final grade of F for the course.

Once the instructor has determined the initial course grade for the student, the final course grade will be evaluated. The student's final course grade will be the same as his or her initial course grade if no more than four class periods during the semester were missed; otherwise, the student's final course grade will be one letter grade lower than his or her initial course grade (for example, an A will become a B).

Are there any conditions for which there was no course of action specified for the instructor to take? If so, what would you do to rectify the problem? Can your decision tree be simplified? If so, simplify it

**Assignment 22**.

Given the following use case, develop a class diagram by first developing a scenario diagram and then reducing it to a class diagram.

a) A customer arrives at an investment consultant and makes an initial enquiry about their investment requirements.
b) The consultant records and files the requirements.
c) The consultant checks the product files.
d) The consultant proposes a number of financial products to the customer for selection.
e) The customer then either selects one of the products.
f) The consultant records the decision in the requirements file.

Alternatives
The customer or proposes a variation to one of the alternatives. The consultant to amend one of the alternatives uses the variation

**Assignment 23**.

For the following problem of car hire system:
Draw a use case model showing any relationships between the use cases.

**USE CASE 1 - DOING RESERVATIONS**
a) A customer contacts a reservation officer about a car rental.
b) The customer quotes the start and end dates needed, the preferred vehicle, and the pickup office.
c) The reservation officer looks up a prices file and quotes a price.
d) The customer agrees to the price.
e) The vehicle availability file is checked to see if an appropriate vehicle is available for the required time at the required office.
f) If the requested vehicle is available at the nominated pickup office, then it is reserved for the customer. An entry is made in the vehicle availability registering the reservation.
g) The reservation officer issues the customer with a rental number. A rental agreement is then created on the rental file, including the rental number, the rental period, the vehicle type and the pickup office.

**Exceptions**

An appropriate vehicle is not available at the pickup office. The customer is offered an alternative vehicle.
The customer does not agree to a price and asks for an alternate vehicle and/or period.

**USE CASE 2 – AVAILABILITY SYSTEM**
a) A vehicle availability file is checked to see if a vehicle of a given type is available at the requested pickup office for a requested rental period. There is a record for each vehicle, which includes the times, when a vehicle is available and when it is rented.
b) If it is, then the vehicle is reserved for the requested period.

## Exception

If a reservation cannot be made because of lack of vehicles a problem report is issued to be used in planning vehicle levels.

## USE CASE 3 - INITIATING RENTAL

    a)  A customer arrives at a pickup office and quotes a rental number to the rental officer.
    b)  The rental file is checked to the customer's rental number.
    c)  If so then the rental agreement is retrieved and discussed with customer.
    d)  If the customer accepts, then a set of rental agreement is printed.
    e)  The customer signs the agreement and lodges a credit card number.
    f)  The rental officer requests the customer to select one of a number of insurance options. Following the selection an insurance policy is filled out and attached to the signed agreement.

## Exception

A customer does not have a prior reservation. In that case a vehicle availability check is made. If a vehicle is available, the customer is offered the vehicle and a price is quoted. If the customer accepts then a rental is initiated.
If the kind of reserved vehicle is not available to a customer with a prior reservation (because of a late return) then an alternate proposal is made to the customer.

## Assignment 24.

Admission procedure in a University is as follows:
An advertisement is issued giving essential qualifications for the course, the last date for receipt of application, and the fee to be enclosed with the application. A clerk in the Registrar's office checks the received applications to see if mark sheet and fee are enclosed and sends valid applications to the concerned academic department. The department checks the application in detail and decides the applicants to be admitted, those to be put in the waiting list, and those rejected. Appropriate letters are sent to the Registrar's office, which intimates the applicant. Give physical and logical DFDs corresponding to the above problem.

## Assignment 25.

A magazine is published monthly and is sent by post to its subscribers. Two months before the expiry of subscription, a reminder is sent to the subscribers. If subscription is not received within a month, another reminder is sent. If renewal subscription is not received up to two weeks before the expiry of the subscription, the subscriber's name is removed from the mailing list and the subscriber informed. Obtain logical DFDs for this problem.

## Assignment 26.

Obtain a physical DFD for a simple payroll system described below.
A list of employees with their basic pay is sent to a clerk. He calculates the gross pay using standard allowances, which are known for each pay slab. Deduction statements such as loan repayment, subscription to association, EPF, Library security etc. is also sent to another clerk who matches these slips with the slips of gross pay and calculates net pay.

This slip is used by a third clerk to write out pay cheques for each employee and sent to respective employees. The total pay bills paid are also computed.

**Assignment 27**.

Draw the context diagram, level 1 and level 2 diagrams for modelling the processing of an ATM.

## A6-R4: DATA STRUCTURE THROUGH 'C++'

### Objective of the Course

The objective of the course is to introduce the fundamentals of Data Structures, Abstract concepts and how these concepts are useful in problem solving.

After completion of this course student will be able to -

- To Understand and the concepts of object oriented language such as c++
- Analyze step by step and develop algorithms to solve real world problems.
- Implementing various data structures viz. Stacks, Queues, Linked Lists, Trees and Graphs.
- Understanding various searching & sorting techniques.

### Outline of Course

| S. No. | Topic | Minimum number of hours |
|--------|-------|-------------------------|
| 1. | Analysis of Algorithm | 10 |
| 2. | Basics of C++, Elementary Data Structures : Arrays, linked lists | 18 |
| 3. | Abstract Data types Stacks and Queues | 05 |
| 4. | Trees | 12 |
| 5. | Searching, sorting and Complexity | 10 |
| 6. | Graphs | 05 |

|  |  |  |
|--------|---|-----|
| **Lectures** | **=** | **60** |
| **Practical/tutorials** | **=** | **60** |
| **Total** | **=** | **120** |

### Detailed Syllabus

**1. Analysis of Algorithm**                                                      **10 Hrs.**
Introduction to Algorithm Design and Data Structures: Design and analysis of algorithm: Algorithm definition, comparison of algorithms. Top down and bottom up approaches to Algorithm design. Analysis of Algorithm; Frequency count, Complexity measures in terms of time and space. Structured approach to programming.

**2. Basics of C++, Elementary Data Structures : Arrays, linked lists**       **18 Hrs.**
Basics of C++: Structure of a program Variables. Data Types. Constants Operators, Basic Input/Output, Control Structure , Functions, Compound Data Types: Arrays, Pointers, Dynamic Memory , Object Oriented Programming :Classes, Encapsulation, Abstraction, inheritance, Polymorphism, Representation of arrays: single and multidimensional arrays. Address calculation using column and row major ordering. Various operations on Arrays, Vectors. Application of arrays: Matrix multiplication, Sparse polynomial representation and addition, Stacks and Queues : Representation of stacks and queues using arrays and linked-list. Circular queues, Priority Queue and D-Queue. Applications of stacks: Conversion from infix to postfix and prefix expressions, Evaluation of postfix

expression using stacks.  Pointers: Definition, Pointer Arithmetic, Array of pointers,  Arrays in terms of pointers.  Linked list: Singly linked list; operations on list,  Linked stacks and queues. Polynomial representation and manipulation using linked lists. Circular linked lists, Doubly linked lists. Generalized list structure. Sparse Matrix representation using generalized list structure, stacks, queues.

### 3.  Abstract Data types Stacks and Queues           05 Hrs.
Definition of ADT, Stack ADT (array implementation), FIFO     queue ADT (array implementation)

### 4. Trees           12 Hrs.
Binary tree traversal methods : Preorder, In-order, Post-ordered    traversal. Recursive Algorithms for above mentioned Traversal methods. Representation of trees and its applications : Binary tree representation  of a general  tree. Conversion of forest into tree. Threaded binary trees.  Binary search tree. :  Height balanced (AVL) tree, B-trees.

### 5. Searching, Sorting and Complexity           10 Hrs.
Selection sort, Insertion sort, Bubble sort, Quick sort, merge sort , Heap sort, Radix sort and their complexity, Searching: Sequential search, Binary Search, Binary Search Tree, ASVL trees, B trees, Searching , sorting and complexity, Searching : Sequential and binary searches, Indexed search, Hashing Schemes. Sorting : Insertion, selection, bubble, Quick, merge, radix, Shell, Heap sort, comparison of time complexity.

### 6. Graphs           05 Hrs.
Graph representation : Adjacency matrix, Adjacency lists,  Traversal schemes : Depth first search, Breadth first search.
Spanning tree : Definition, Minimal spanning tree algorithms. Shortest Path algorithms (Prime's and   Kruskal 's).

**RECOMMENDED BOOKS**

**MAIN READING**

1. Hubbard John. R, "Schaum's outline of Data Structures with C++", Tata McGraw-Hill, 2007.
2. Langsam Y,.Augenstein M.J and Tanenbaum A. M, "Data Structures Using  C and C++", Second Edition, Pearson Education, 2007.
3. Kruse R, Tonodo C.L. and Leung B, "Data Structures and Program Design in C", Pearson Education, 2007.

**SUPPLEMENTARY READING**

1. Horowitz E, Sahni S and Mehta D, "Fundamentals of Data Structures in C++," Galgotia Publiction, 2009.
2. Weiss M A, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2007.
3. Litvin G, "Programmking with C++ and Data Structures", Vikas Publishing House.

# A6-R4: DATA STRUCTURE THROUGH C++

**NOTE:**

| | |
|---|---|
| 1. | There are **TWO PARTS** in this Module/Paper.  **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions. |
| 2. | **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein.  **PART ONE** is **NOT** to be answered in the answer book. |
| 3. | Maximum time allotted for **PART ONE** is **ONE HOUR**.  Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned.  However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**. |

**TOTAL TIME: 3 HOURS**                                      **TOTAL MARKS: 100**
                                                   **(PART ONE – 40; PART TWO – 60)**

## PART ONE
**(Answer ALL Questions; each question carries ONE mark)**

1.  **Each question below gives a multiple choice of answers. Choose the most appropriate one and enter in the "tear-off" answer sheet attached to the question paper, following the instructions therein.**

1.1  The equivalent prefix expression corresponding to (A + B) – (C + D * E) / F * G is
   a)   - + A B * / + C DE * F G
   b)   / - + AB * + C  * D E F G
   c)   - / + A B * + C D E * F G
   d)   - + A B * / + C * D E F G

1.2  The address of a[2][3][4] is_____  where a[3][4][5] is stored in row major order with base address 1050. Assume element size is 4 bytes and the index values start from 0.
   a    1200
   b)   1286
   c    1100
   d)   1186

1.3  The number of nodes in a strict binary tree with n leaves is
   a)   2n - 1
   b)   2n
   c)   2n +1
   d)   2n +2

1.4  The best case of insertion sort is
   a    when the data is randomly ordered.
   b)   when the data is sorted in reverse order of what is required
   c)   when the data is sorted in the same order as what is required
   d)   none of the above

1.5  Building new classes from existing classes is

a) encapsulation
b) polymorphism
c) inheritance
d) data hiding

1.6 What is the following function doing?

```
int mystery(int temp, int a[], int i) {
        if (i < 0)
                return temp;
        else    {
                if ( temp < a[i])
                        temp = a[i];
                return mystery(temp, a, i - 1);
        }
   }
```

a) finding the position of the minimum element in the array passed to it as an argument
b) finding the position of the maximum element in the array passed to it as an argument
c) finding the minimum value in the array passed to it as an argument
d) finding the maximum value in the array passed to it as an argument

1.7 A right in-threaded binary tree has
a) right links having NULL replaced by a special link to the predecessor of the node in inorder traversal
b) right links having NULL replaced by a special link to the successor of the node in inorder traversal
c) left links having NULL replaced by a special link to the predecessor of the node in inorder traversal
d) left links having NULL replaced by a special link to the successor of the node in inorder traversal

1.8 In _____ , a mathematical function is used to determine the location of a record.
a) AVL tree
b) Stack
c) Hashing
d) Adjacency matrix

1.9 Which of the following is not an application of stacks?
a) matrix multiplication
b) implementing function calls
c) conversion of an expression from infix to postfix form
d) determining whether the parentheses in an expression are balanced or not

1.10 Postorder traversal of a tree consists of three steps:
        1.    Visit the root
        2.    Traverse left subtree in postorder
        3.    Traverse right subtree in postorder
The correct sequence of steps is
a)    1 2 3
b)    1 3 2
c)    2 3 1

d) 3 2 1

**2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book**

2.1 Preorder traversal of a tree is the mirror image of its postorder traversal.
2.2 Strict FIFO order is followed in priority queue.
2.3 In selection sort, once the shortest element found in $i^{th}$ iteration is placed at a particular position, it does not change its position after that.
2.4 Given a function prototype as *void fn(char \*\*ptr, int n)* and a variable *char a[10]*, a call to the function can be *fn(&a[3], 10)*.
2.5 Linked list can be implemented using arrays also.
2.6 B-trees have all the leaves at the same level.
2.7 On subtracting two pointers, we get the number of bytes between the two addresses being pointed to by the pointers.
2.8 A graph without cycles is also known as a tree.
2.9 Linear search can be applied on sorted data.
2.10 Queues are used to evaluate prefix expressions.

**3. Match words and phrases in column X with the nearest in meaning in column Y.**

| **X** | | **Y** | |
|---|---|---|---|
| 3.1 | Inorder traversal of binary search tree | A. | Bubble sort |
| 3.2 | Sparse matrix | B. | Prim's algorithm |
| 3.3 | *new* operator | C. | $O(n^3)$ |
| 3.4 | Shortest path | D. | Non-linear data structure |
| 3.5 | Compound data type | E. | Ordered list |
| 3.6 | Matrix multiplication complexity | F. | Mostly non zero entries |
| 3.7 | Recursion | G. | Dynamic memory allocation |
| 3.8 | Linked Lists | H. | Hashing |
| 3.9 | Consecutive elements comparison | I. | Integer |
| 3.10 | Open addressing | J. | Dijkstra's algorithm |
| | | K. | $O(n^2)$ |
| | | L. | Linear data structure |
| | | M. | Defining new data type |
| | | N. | Polymorphism |
| | | O. | Mostly zero entries |
| | | P. | Divide and conquer strategy |
| | | Q. | Heap sort |
| | | R. | Array |

**4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:**

| (a) | Hash tables | (b) | int *p[10]; | (c) | Depth |
|---|---|---|---|---|---|
| (d) | Complete binary tree | (e) | $O(n^2)$ | (f) | n + 1 |
| (g) | Binary search tree | (h) | Adjacency lists | (i) | Data |
| (j) | Stacks | (k) | n − 1 | (l) | Objects |
| (m) | Radix | (n) | AVL tree | (o) | Index |

| (p) | Heap sort | (q) | Shell sort | (r) | O(n lgn) |
|---|---|---|---|---|---|
| (s) | Breadth | (t) | n | (u) | int (*p)[10]; |
| (v) | General tree | (w) | Bubble sort | (x) | Quicksort |

4.1   Another name for height balanced tree is_____   .
4.2   Mergesort has_____   complexity.
4.3   Graphs can be represented using_____   .
4.4   _____ represents an array of pointers.
4.5   Preorder traversal of a tree is a type of_____   first search.
4.6    A tree with n vertices has_____   edges.
4.7   _____ are instances of classes.
4.8   Indexed sequential search requires_____   file to be in sorted order.
4.9   _____ uses the concept of increments to sort data.
4.10  A _____ is a tree with the maximum number of nodes for a given depth.

## PART TWO
### (Answer any FOUR questions)

**5.**

a.  Create a class TwoDim which contains x and y coordinates as int. Define the default constructor, parameterized constructor and void print() to print the co-ordinates. Now reuse this class in ThreeDim adding a new dimension as z of type int. Define the constructors for the derived class and override the method void print() in the subclass. Write main() to show runtime polymorphism.

b.  Apply binary search algorithm to search for 90, in the following list of numbers:
12, 25, 33, 37, 48, 50, 53, 57, 86, 92
Show the outcome after each iteration.

**(9+6)**

**6.**

a.  Convert the following tree into a binary tree
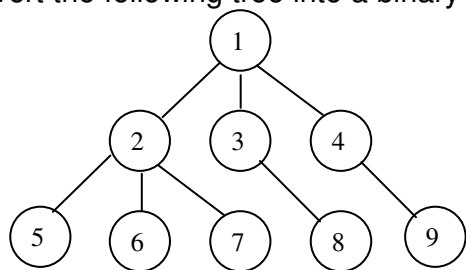


b.  Create a binary search tree for the following sequence:
Tina, Manik, Nupur, Utsav, Neha, Alka, Sehej, Monika, Geetu, Uday

c.  What do you understand by space and time complexity? Calculate the space and time complexity of linear search method.

**(3+5+7)**

**7.**

a.  Write a C++ program to create a doubly linked circular list L, with a header node. The data values of nodes are of character type. The nodes are to be inserted in the list in such a way that the nodes are in ascending order of their data values. In addition to this, it should be possible to delete a node with the given data value from the list.

b.  Evaluate the following prefix expression:
**A+BC-+CBA

Assume A = 1, B = 2 and C = 3

**(12+3)**

**8.**

a. What is an ADT? Briefly explain the various components of an ADT.
b. Apply heapsort on the following unsorted list of keys
   8, 20, 9, 4, 15, 10, 7
   Show intermediate the steps.

**(6+9)**

**9.**

a. Draw a B-tree for the following data: 23, 65, 37, 60, 48, 91, 15, 75, 86 and 58. Suppose that the search field values are inserted in the given order in a B-tree of order p = 3; show how the tree will expand and what will the final tree look like?
b. Consider the following graph:
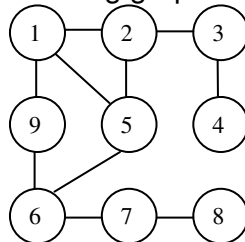


Give the implementation of the graph as an adjacency matrix. Also write the depth-first and breadth-first traversals of the graph.

**(9+6)**

# A6-R4: DATA STRUCTURE THROUGH C++

**Assignment 1**.

Write a program that reads ten numbers from the user. These ten numbers represent the scores that a student has received in a class. Your program should create a nicely formatted report that displays all ten scores as well as the total score and average score that the student received.

**Assignment 2**.

Write a C++ program that reads ten numbers from the user. After reading all ten numbers, compute the sum of the odd-positioned numbers, multiply all of the even-positioned numbers together, and add these two numbers together. That is, you should add the first, third, fifth, seventh, and ninth numbers. You will then multiply the second, fourth, sixth, eighth, and tenth numbers. The sum of these two numbers is your final result.

**Assignment 3**.

The library circulation system will keep track of every book as well as library cardholders. Each time a book is checked out or returned, the system must keep track of it. Books can be added to the library's collection and also removed. Due dates for books should be tracked, as well as notices sent out for materials that are more than a week overdue. Fines for overdue materials should be calculated, and a record kept of the amount owed by each cardholder.

Design appropriate classes that keep records of book(book no, book name, author name), cardholders(member no, member name, age, address, city) and issue_return(book no, member no, date of issue , date of return, fine). Write appropriate functions
a) for keeping records of books,videos and audios in the library.
b) for checking out or returning of book
c) for adding or removing of books in the library
d) for keeping track of fine due if the book is returned after due date

**Assignment 4**.

a) Write a program that can be used as a database of student's information for a department. The program should be able to dynamically allocate or deallocate storage for the student's records using linked lists. The database should have the following fields: the first and last names, a course code, and a grade for a student.
    The program should display the following menu:
    Welcome to the database menu!
    Press 1 to insert a new record
    Press 2 to delete a record
    Press 3 to search the database (by last name)
    Press 4 to print a range in the database
    Press 9 to quit

b) Write a program for merging two sorted linked lists to form a third sorted linked list.

**Assignment 5**.

Implement a sparse matrix in which any or most of the entries are zero. Because allocating memory space for all entries of the matrix will be wasteful we intend to allocate memory space only for nonzero entries.

   (a) Represent a sparse matrix as a doubly linked circular or any other data structure which you think is useful.
   (b) Write a program to perform the following operations:
   (i) Read in inputs for the entries of a sparse matrix and form a suitable data structure.
   (ii) Addition of two sparse matrices
   (iii) Subtraction of two sparse matrices
   (iv) Multiplication of two sparse matrices
   (v) Deletion of a sparse matrix
   (vi) Print sparse matrix (in matrix form)
   Hint : Each entry of a sparse matrix can be viewed as a structure of the form

| Row-index | Column-index | Value |
|-----------|--------------|-------|
| Left pointer | | Up pointer |

Row index points to the next row (i.e. down). Column-index points to the next column (i.e. right).Value points to the information of data type added. Left pointer points to the element towards the next left element. Right pointer points to the element towards the next up element.

## Assignment 6.

There are three circular disks having a hole in the center and placed on a peg and there are two empty pegs. The three disks are of different sizes. It is now required to transfer the three disks (named A, B, and C : C is smallest) from the source peg P1 to the target peg P2 using a standby peg P3 such that

   (i) only one disk can be moved at a time and
   (ii) no disk can be kept on top of a disk with smaller diameter.
   Build a system that gives the solution for the above problem.
   [ Hint: Assume that there are three stacks for three pegs SP1, SP2, and SP3.
   Transferring a disk
   from one peg to other involves ADD and DELETE operations of stacks ]

## Assignment 7.

Given a linked list of integers sorted from smallest (at the head end) to largest, and a pointer to a single node containing an integer, make appropriate function that insert the node in the linked list so that it remains sorted.

## Assignment 8.

Implement a data structure that supports the following operations: insert, findMin, findMax, deleteMin, deleteMax, isEmpty, makeEmpty. You must use the following algorithm: maintain a sorted array. Insert new items into the correct position in the array, sliding elements over one position to the right, as needed. findMin and findMax, and deleteMax are trivial. For deleteMin remove the item in position 0, and slide over all the other items one position to the left.

**Assignment 9**.

Companies and people often buy and sells stocks. Often they buy the same stock for different prices at different times. Say a person owns 1000 shares a certain stock (such as Checkpoint), she may have bought the stock in amounts of 100 shares over 10 different times with 10 different prices.

In this assignment, you will be using a stack for Lifo accounting. You should use an array based implementation for your stack based implementation or a linked list for implementing your stack. Your stack should have records with the following fields:
The name of the stock (a string or int)
The number of shares of a stock (an int)
The purchase price (can be a decimal)

You can assume that the first element of the structure is the security bought first, the second was bought second, etc.

Create a program that should have the user able to enter information about various stocks, the amount of shares, and the price. The user can then enter a query about a certain stock and the cost according to the Lifo accounting methods for a certain number of shares.

The following could be your menu:

Press 1 to enter a new stock.
Press 2 to find the Lifo price for a stock.

If 1 is pressed, the user needs to enter the stock symbol, and the number of shares, and the price.
If 2 is pressed, the user needs to enter the stock symbol being queried and the number of shares in question.

**Assignment 10**.

Companies and people often buy and sells stocks.  Often they buy the same stock for different prices at different times. Say a person owns 1000 shares a certain stock (such as Checkpoint), she may have bought the stock in amounts of 100 shares over 10 different times with 10 different prices.

In this assignment, you will be using a queue for storing data for Fifo accounting You should use an array based implementation for your queue based implementation or a linked list for implementing your queue.

Your queue should have records with the following fields:
The name of the stock (a string or int)
The number of shares of a stock (an int)
The purchase price (can be a decimal)

You can assume that the first element of the structure is the security bought first, the second was bought second, etc.
Create a program that should have the user able to enter information about various stocks, the amount of shares, and the price.  The user can then enter a query about a

certain stock and the cost according to the Fifo accounting methods for a certain number of shares.

The following could be your menu:

Press 1 to enter a new stock
Press 2 to find the Lifo and Fifo price for a stock.

If 1 is pressed, the user needs to enter the stock symbol, and the number of shares, and the price.
If 2 is pressed, the user needs to enter the stock symbol being queried and the number of shares in question.

## Assignment 11.

A deque is a data structure consisting of a list of items, on which the following operations are possible:
   a) push x : Insert x on the front end of the deque.
   b) pop     : Remove the front item from the deque and return it.
   c) inject x : Insert x on the rear end of the deque.
   d) eject : Remove the rear item from the deque and return it.
Describe routines to support the deque that take constant number of steps for each operation. You may use array-based or pointer-based implementation.

## Assignment 12.

A Matrix is a rectangular arrangement of values  where each element is specified as
   $A=\{a[i,j]\}m*n$
   a[i,j] is element at i-th row and j-th  column.
   m is the number of rows, n is the number of columns.
   Assume we have multiplication of two matrices as

$$
\begin{bmatrix} 1 & 1 & 4 \\ 2 & 3 & 2 \\ 3 & 2 & 1 \end{bmatrix} * \begin{bmatrix} 2 & 3 & 4 \\ 2 & 1 & 2 \\ 3 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 16 & 8 & 10 \\ 16 & 11 & 16 \\ 13 & 12 & 17 \end{bmatrix}
$$

Write a program for Multiplication of two matrices using OOP concept?

## Assignment 13.

A polynomial(quadratic) is as
   $ax^2 + bx + c$ where a,b,c are constants and x is a variable
   Here's a table of names for polynomials and their sources:

| degree | name | shape | dimension |
| ------ | --------- | ------ | --------- |
| 1 | linear | line | (1) |
| 2 | quadratic | square | (2) |
| 3 | cubic | cube | (3) |
| 4 | quartic | - | 4 |
| 5 | quintic | - | 5 |

a) Write a program for implementing a polynomial of degree 2?
b) Write a program for adding and subtract two polynomials(Using Linked List)

**Assignment 14**.

Consider a database of student's information for a department . The program should be able to dynamically allocate or deallocate storage for the student's records. The database should have the following fields:

    the first and last names, a course code, and a grade for a student

    Create a C++ function to search a particular student's information from the database using

    a) linear search and

    b) binary search

**Assignment 15**.

Consider a database of patient's information for a hospital. The program should be able to allocate and deallocate storage memory for the patient's records. The database should have the following information field:

    the first and last names, patient id, address , related disease , date of admission

    Devise an appropriate C++ class and circular queue using arrays to implement the following functions

    a) creation of circular queue,

    b) accessing the element from the circular queue, and

    c) searching element from the circular queue.

**Assignment 16**.

Create a Phone Book Data Store class. The requirements for this class are given below:

    -Create 2 String arrays for storing names and numbers, respectively.

    -Create class member variables for the capacity of the storage and the number of entries in use.

    -Use the constructor to initialize the arrays to a size specified by a parameter.

    -On this class, create and implement the following 4 methods:

        o storeNumber( ) should take two parameters, the name and the phone number to store; it will not return any value. It will iterate through the store, find the next open space, and store the name and number.

        o retrieveNumber( ) should take one parameter, the name, and return one parameter, the number. It will iterate through the storeuntil it matches the name, and then return the number.

        o replaceNumber( ) should take two parameters, the name and the phone number to store; it will not return any value. It will iterate through the store until it matches the name, and then replace the number.

        o getAllNamesAndNumbers( ) does not take any parameters. It will return a list of all of the names and numbers stored in the store.

    -Use the PhoneBookDataStore.main( ) method to test the data structure. Create an instance that stores 5 numbers.

    Finally, create an instance of PhoneBookDataStore as a member of your PhoneBook class, and

    implement the user interface (e.g. prompting) using circular linked list to

    (a) collect names and phone numbers from the user and store them in the data store and

    (b) print out a list of names and numbers.

**Assignment 17.**

a) Infix, Postfix and Prefix notations are three different but equivalent ways of writing expressions.

   Infix notation: X + Y
   Operators are written in-between their operands. This is the usual way we write expressions. An expression such as A * ( B + C ) / D is usually                taken                to mean something like: "First add B and C together, then multiply the result by A, then divide by D to give the final answer."
   Postfix notation (also known as "Reverse Polish notation"): X Y +
   Operators are written after their operands. The infix expression given above is equivalent to A B C + * D /
   Prefix notation (also known as "Polish notation"): + X Y
   Operators are written before their operands. The expressions given above are equivalent to / * A + B C D

Write a program in C++ to convert an expression into a) prefix and b) postfix expression?
  b) Write a C++ program for the evaluation of postfix expression using Stack?

**Assignment 18.**

Implement a class of your own: a priority queue for a hospital emergency room, for example, where it needs to schedule patients according to priority. A patient with a more critical problem will pre-empt others even if they have been waiting longer. This is a priority queue, where elements are prioritized relative to each other and when asked to dequeue one, it is the highest priority element in the queue that is removed.

Write necessary functions on a priority queue as
a)   create a empty queue,
b)   whenever a more critical patient come, the system will preempt the queue and add patient in the queue depending on its priority,
c)   access all patients information from the queue?

**Assignment 19.**

Parsing a file is when you read a file to collect information from the file.
In this assignment, you will parse a file, and put all of the words in a BST. You will use the BST to collect data about the number of times a word was found in the file. You should make no assumptions about which letters are in the middle (like M). The first word you encounter will be the root. If the next word is greater, put it to the right. If it is less, put it to the left. It is possible that the tree you make will be very very sparse (think what happens when the first word is zylberstein). Assume all words in the file are lower case (you can covert them easily anyway). I would recommend using the string library (it makes comparisons much better).

   Devise appropriate functions  for
      a)  creating a BST,
      b)  adding any word,
      c)  deleting any word,
      d)  modification of any word, and
      e)  searching any word in a BST.

**Assignment 20**.

Build a Binary Search tree by adding the following items into an
      empty Binary Search Tree, in order:
         a)  J, T, E, G, F, B, A, R, O, P, U, M, N, K, L, H, D, S, C, Q, I
      Write the functions for the tree in each of the following orders:
        a)  Pre-order first traversal
        b)  In-order  first traversal
        c)  In-order  first traversal

**Assignment 21**.

There are different sorting techniques used for arranging the values present in the list.
      Suppose we have a list of names of persons as
       a)"Rajan", "Rohit", "Aman", "Jinny", "Sanjay", "Bhatachariya"
      Write C++ programs arrange these names using:
      a) Bubble Sort,
      b) Selection Sort,
      c) Insertion Sort,
      d) Quicksort,
      e) Heap Sort
      f) Merge Sort
      ii) Differentiate between sorting Arrays vs sorting Linked Lists?

**Assignment 22**.

A bank needs to maintain records of its customers. It is decided to create a database using
B-Tree or any other data structure which you think is useful. The order is based on the key
and the Social Security number of each Customer. Each record contains the following
information.
     Name
     Social Security Number
     Street Address
     City
     State
     Pin code
     Date of Birth
     Marital Status
     Account Number
     Account Type (Fixed, Saving, etc.)
     A DBMS needs to be designed to provide menu driven facility to its users. The
     facilities are :
     I. Insert the record for a new customer
     F. Find and display the record for a customer specified by name or by social security
     number
     U. Update the record
     D. Delete the record of a customer from the database.

**Assignment 23**.

A balanced binary search tree where the height of the two subtrees(children) of a node differs by at most one is known as AVL tree. Insert 2 ,9 ,4 ,1, 7, 10, 3, 6, 5, 8 one by one into an initially empty AVL tree. Show the AVL tree after each insertion.

Write a C++ program for creating AVL tree-with insertion, deletion of data values into it?

## Assignment 24

Kruskal's algorithm is an algorithm for computing a minimum spanning tree. It maintains a set of partial minimum spanning trees, and repeatedly adds the shortest edge in the graph whose vertices are in different partial minimum spanning trees.

Write a C++ program for implementing Kruskal's algorithm for a graph shown in Figure 1?
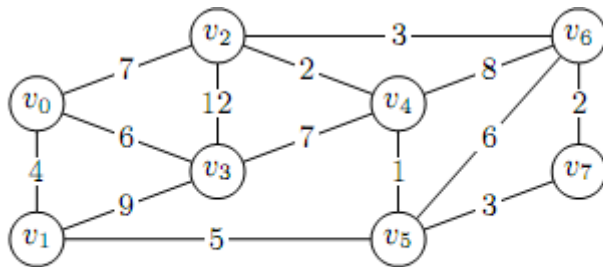


Figure 1: Undirected Graph

.
## Assignment 25.

In Prim's algorithm,we compute a minimum spanning tree by beginning with any vertex as the current tree. At each step add a least edge between any vertex not in the tree and any vertex in the tree. Continue until all vertices have been added.

Write a C++ program for implementing Prim's algorithm for a graph shown in Figure1?

## Assignment 26.

Depth First Search is any search algorithm that considers outgoing edges (children) of a vertex before any of the vertex's siblings, that is, outgoing edges of the vertex's predecessor in the search. Extremes are searched first. This is typically implemented with a stack. Also known as DFS. Write a program in C++ to find the DFS of the graph shown in Figure 2?
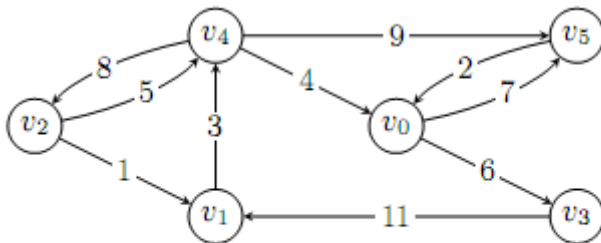


Figure 2: Directed Graph

## Assignment 27.

Breadth First Search is any search algorithm that considers neighbours of a vertex, that is, outgoing edges of the vertex's predecessor in the search, before any outgoing edges of the vertex. Extremes are searched last. This is typically implemented with a queue. Also Known as BFS. Write a program in C++ to find the BFS of the graph shown in Figure 2?

# A7-R4: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM

## Objective of the Course

This course will allow students to develop background knowledge as well as core expertise in Database Management Systems. The students will learn Database concept, Data Structure, Data Models, various approaches to Database design, strengths of relational model, Normalization.

At the end of the course the student will be able to
- Understand Database design and normalisation techniques.
- Use Standard Query Language and its various versions.
- Understand Importance of backup and recovery techniques.
- Develop Database system to handle the real world problem.

## Outline of Course

| S. No. | Topic | Minimum number of hours |
|--------|-------|-------------------------|
| 1. | An Overview of Database Management System | 04 |
| 2. | An Architecture of the Database System | 04 |
| 3. | Relational Database Management System | 08 |
| 4. | Normalization | 08 |
| 5. | Relational Algebra and Relational Calculus | 08 |
| 6. | The SQL Language | 12 |
| 7. | Backup and Recovery | 02 |
| 8. | Security | 02 |
| 9. | Integrity | 02 |
| 10. | Design and Development of Database Applications | 10 |

|   |   |   |
|---|---|---|
| **Lectures** | **=** | **60** |
| **Practical/tutorials** | **=** | **60** |
| **Total** | **=** | **120** |

## Detailed Syllabus

### 1. An Overview of the Database Management System                    04 Hrs.
What is database?, Why database?, database system, database management system (DBMS), advantages of DBMS.

### 2. An Architecture of the Database system                    04 Hrs.
Three levels of architecture, mappings, role of database administrator(DBA), E-R model, three approaches of DBMS- relational, hierarchical and network.

### 3. Relational Database Management System (RDBMS)                    08 Hrs.
Introduction, RDBMS terminology, relational model, base tables, keys.

**4. Normalization**                                                          **08 Hrs.**
    Normal forms, Boyce-Codd Normal form, higher normal forms.

**5. Relational Algebra and Relational Calculus**                              **08 Hrs.**
Relational operators, tuple calculus, well formed formulae.

**6. The SQL Language**                                                        **12 Hrs.**
Introduction , Characteristics of SQL, data definition, data manipulation, SQL commands, SQL operators, Queries, aggregate functions.

**7. Backup and Recovery**                                                     **02 Hrs.**
Transaction recovery, system recovery, SQL  support

**8. Security**                                                                **02 Hrs.**
General considerations, controls, audit trail, data encryption, SQL support.

**9.  Integrity**                                                              **02 Hrs.**
General considerations ,integrity rules, SQL support.

**10. Design and Development of Database Applications**                        **10 Hrs.**
Database applications using some standard RDBMS.

**RECOMMENDED BOOKS**

**MAIN READING**

1. Silberschatz A, Korth H.F and Sudarshan S, "Database System Concepts", Fifth Edition, Tata McGraw-Hill, 2006.
2. C.J.Date, " An introduction to Database Systems", Pearson Education, 2007.
3. R. Elmasri, S. B Navathe, " Fundamentals of Database System", Pearson Education, 2007.
4. Desai C. Bipin, "An Introduction to Database Systems", Galgotia Publication, 2009.

**SUPPLEMENTARY READING**

1. Leon A and Leon M, "Fundamentals of  DBMS", Vijay Nicole & Tata McGraw-Hill, 2007.
2. Gill P.S, "DBMS", I.K. International, 2008.
3. Singh S.K, "Database Systems: Concepts, Design & Applications", Pearson Education, 2008.
4. Leon A and Leon M, "Database Management Systems", Vikas Publishing House.

# A7-R4: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM

## Model Question Paper

**NOTE:**

| | |
|---|---|
| 1. | There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions. |
| 2. | **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book. |
| 3. | Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**. |

**TOTAL TIME: 3 HOURS**  **TOTAL MARKS: 100**
**(PART ONE: 40; PART TWO: 60)**

### PART ONE
### (Answer all the questions; each question carries ONE mark)

**1.** **Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1. One of the following is a valid record -based data models
   e) Object-oriented model
   f) Relational model
   g) Entity-relationship model
   h) None of the above

1.2. Which of the following is not a valid unary operation in the relational algebra?
   e) select
   f) min
   g) project
   h) rename

1.3. An abstraction concept for building composite objects from their component object is called
   e) Specialization
   f) Normalization
   g) Generalization
   h) Aggregation

1.4. The expression (RUS)-((R-S)U(S-R)) is equivalent to
   e) R □□S
   f) R □□S
   g) □□(condition) (RxS)
   h) □(RxS)

1.5. To represent many to many relationship between two entity types A and B in a relational model
   e) put identifying attribute(s) of A in the relation representing B.
   f) put identifying attribute(s) of B in the relation representing A.
   g) create a new relation to represent the relationship.
   h) It can not be represented.

1.6. If a relation A has m attributes and relation B has n attributes and A divide by B is possible then A divide by B has
   e) m*n attributes
   f) m-n attributes
   g) n-m attributes
   h) m / n attributes

1.7. Which of the following cannot enhance database system throughput?
   e) Database system throughput can be enhanced by locking the smallest sized objects possible
   f) Database system throughput can be enhanced by reducing the time that transaction that hold locks
   g) Database system throughput can be enhanced by reducing the hot spots (frequently accessed and modified database objects)
   h) Increasing the main memory capacity can enhance database system throughput.

1.8. Object based data models are used in describing the abstraction of the following level(5).
   e) Only physical
   f) Conceptual and view
   g) Physical and conceptual
   h) None of the above

1.9. Assume transaction A holds a shared lock R. If transaction B also requests for a shared lock on R.
   e) it will result in a deadlock situation
   f) it will immediately be granted
   g) it will immediately be rejected
   h) it will be granted as soon as it is release by A

1.10. In which of the following situations would one have to use an outer join in order to obtain the desired results?
   e) A report is desired that lists all customers who placed an order.
   f) A report is desired that lists all customers and the total of their orders.
   g) A report is desired that lists all customers, the total of their orders during the most recent month, and includes customers who did not place an order during the month (their total will be zero).
   h) There is never a situation that requires only an outer join.

2. **Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book.**

In a hierarchical database, modeling of many to many relations in achieved by record replication.

Two–phase locking protocols ensures freedom from deadlock.

A constraint is a rule in a database system that can be violated by users.

Integrity constraint guard against accidental damage to the database.

The recovery manager is responsible for implementing a particular strategy for concurring control.

Specialization is the reverse of generalization.

Domain relational calculus restricted to safe domain expressions is equivalent in expressive power to the basic relational algebra.

2.8   The process of check pointing reduces the amount of work done by DBMS during the restarting process.

2.9   A view is a table whose rows are computed as needed.

2.10  If GROUP BY is omitted in a SELECT command; entire table is taken as a group.

**4.   Match words and phrases in column X with the nearest in meaning in column Y.**

| X | Y |
|---|---|
| 3.1  Operation that create a new instance of a class is called a(n) | n)  Unary |
| 3.2  Shows the static structure of an object-oriented model | o)  constructor operation |
| 3.3  A set of values that may be assigned to an attribute. | p)  DDL |
| 3.4  A system used in transaction-oriented applications that involve real-time processing of transactions. | q)  Online                    Transaction Processing |
| 3.5   Relationship occurs between two instances of a single entity type | r)  DISTINCT |
| 3.6   Encoding data to make them unintelligible to unauthorized persons. | s)  Domain |
| 3.7   A logical representation of the data for an organization | t)  Data recovery |
| 3.8   Data Dictionary | u)  Class Diagram |
| 3.9   Shadow paging | v)  entity-relationship model |
| 3.10  Eliminate duplicate rows from the query result set. | w)  DML |
|  | x)  Encryption |
|  | y)  Deadlock |
|  | z)  Cardinality |

**5.   Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below :**

| (a) Encapsulation | (b) Class | (c) Structured Query Language | (d) entity |
|---|---|---|---|
| (e) Candidate key | (f) enterprise data modeling outer jain | (g) abstract class | (h) CASCADE |
| (i) Interleaved main memory | (j) Virtual memory | (k) conceptual schema | (l) client |

| (m) null | | | |
|---|---|---|---|

_____ is a tool even non-programmers can use to access information from a database.

The first step in database development, in which the scope and general contents of databases are specified, is called _____.

The _____ tier concentrates on managing the user-system interface as well as localized data.

When creating tables using the CREATE TABLE statement, NOT NULL constrains an attribute from being assigned a(n) _____ value.

An attribute or combination of attributes that uniquely identifies a row in a relation is called a(n) _____ _____.

_____ is the technique of hiding the internal implementation details of an object from its external view.

A class that has no direct instances, but whose descendants may have direct instances is called a(n) _____ _____.

Using an _____ _____ produces this information: rows that do not have matching values in common columns are also included in the result table.

The ON UPDATE _____ option allows changes to a parent table to pass onto a child table or tables.

Transforming data in blocks from the main memory to the cache memory enables an _____unit to operate at its maximum speed.

## PART TWO
### (Answer any FOUR questions)

**5.**
a. Construct an ER diagram (including important attributes) for a car insurance database that includes data about Customer (Car owner), Cars, accident, drivers involved in accidents and injured drivers and/or passengers. Note that any customer can insure many cars, each car may have different drivers at different times and accidents typically involved one or more cars.

b. Explain the advantages and disadvantages of Database Processing?

**(10+5)**

**6.**
a. Explain the purpose and scope of Database security and explain the following in terms of providing security for a database: authorization, views, backup and recovery, Integrity, encryption and RAID technology.

b. Consistency and reliability aspects of transaction are due to the ACIDity properties of transaction. Discuss each of these properties and how they relate to the concurrency control and recovery mechanisms? Give examples to illustrate your answer.

**(8+7)**

**7.**
a. Explain the difference between external, internal and conceptual schemas. How these different layers are related to the concepts of logical and physical and physical data independence.

b. What is a time stamp? How do time stamp based protocols for concurrency control differ from locking based protocols?

**(7+8)**

**8.**
a. Consider the following Relation Schema. An employee can work in more than one department:
Emp (E-id, E_name, Salary)

Dept (d_id, d_name, manager_id, floor_number)
Write the following queries in SQL:
I. Print the name of all employees, who work on the 10th floor and earn salary less than Rs.50,000.
II. Print the names of the departments that employee Santa work in.
III. Print the names of all managers who manage three or more departments on the same floor.
IV. Print the names of all employees who work on floors where Jane Donald works.
V. Give every employee who works in the toys dept. at 10% raise in the salary.

b.   Explain 3rd normal form with suitable example.
c.   In what way dynamic SQL is different from embedded SQL?

**(5+5+5)**

**9.**
a.   Explain the Codd rules regarding null values and database description.
b.   Explain the three levels ANSI/SPARC database architecture with its significance.
c.   Explain with examples, how primary key and foreign key concepts is useful in relational data model?

**(6+6+3)**

# A7-R4: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM

**Assignment 1.**

The following tables form part of a database held in a relational DBMS:
Hotel (Hotel_No , Name, Address)
Room (Room_No, Hotel_No, Type, Price)
Booking (Hotel_No, Guest_No, Date_From, Date_To, Room_No)
Guest (Guest_No, Name, Address)
where Hotel contains hotel details and Hotel_No is the primary key.  Room contains room details for each hotel and (Hotel_No, Room_No) forms the primary key.
Booking contains details of the bookings and the primary key comprises (Hotel_No, Guest_No, Date From) and Guest contains guest details and Guest_No is the primary key.

**Write the SQL statements for the following**:
a)      List full details of all hotels in Mumbai.
b)      List the names and addresses of all guests in New Delhi, alphabetically ordered by name.
c)      List all double or family rooms with a price below Rs.800 per day, in ascending order of  price.
d)      List the bookings for which no date to has been specified.
e)      What is the total daily revenue from all the double rooms?
f)      How many different guests have made bookings for August, 2006?
g)      List the price and type of all rooms at the hotel Land Mark.
h)      What is the total income from bookings for the hotel Manor today

**Assignment 2.**

Create an E R diagram and relational schema to hold information about the situation in many institutions affiliated to some University, many teachers of different disciplines are teaching to many students enrolled in many courses offered by the university to the students through the institutions. Use concept of keys, aggregation, generalisation, cardinality etc. in a proper way.
Say the schema of respective entities is:

Teacher( T#, Tname, Tqual, Tsubject, Tcourse, Prog)
Student(Roll#., Sname, Sage, Saddress, Scourse.Prog , Smarks)
Teaches(T#, Roll# , Scourse, Prog ,University)

**Assignment 3.**

 Performa following queries in SQL using the above schema:
   a)  Find details of Teachers who taught DBMS.
   b)  Find details of students who did MCA from PB University.
   c)  Find courses taught by T# 5078.
   d)  Find address of students whose marks are less than 50.


**Assignment 4.**

Consider the following requirements for a construction company that uses database system to keep track of its projects, workers and material requirements of various projects.

---

The projects for the company are of two kinds: (i) Turn key projects and (ii) Others.

All the projects have a life cycle (Please note that the turn key projects have a maintenance phase in addition.) and workers are allotted as per the phase of the project. Each project has its own plan of completion that is drawn at the start of the project. The worker and material requirement of project is calculated at the start of the project.

The store manages the materials. One of the major constraints for the store is that it requires 15 days to acquire a product. Thus, the inventory should fulfil the requirements of the next 15 days.

The store also keeps track of the issue of materials and return of defective materials to various projects.

The company keeps the information of all the clients including the information about the projects that are being maintained by the company (turn key projects).

Draw an ER diagram for the above company. Specify key attributes and constraints of each entity type and of each relationship type. Note any unspecified requirements and make appropriate assumptions to make the specification complete. Also, design the normalised tables with required integrity and security constraints.

## Assignment 5.

Assume that a Consumer item lease Company which leases various household items to its clients for their use for a specific period of time, maintains the following tables:

Clients (clientID, name, address, contact Phone)
Itemlist (itemID, itemName, itemCost, purchase Date )
Leaselist (clientID, transactionNO, itemID, startDate, returnDate, amountTObeCharged)

Note: A client may lease an item many times. Amount to be charged is calculated as per a fixed rate multiplied by number of days item is leased. All items have unique itemID. However, two or more items may have same name.

Create the tables having appropriate referential integrity constraints. Make and state assumptions, if any.

Write and run the following SQL queries on the tables:

a)     Find all the client names that have not got any item leased during the last month and no leased item is pending with them.
b)     Find the list of all the items that were leased or returned last month.
c)     Find the names of all those clients who have given the business to the company in the decreasing order of total amount paid by a client.
d)     List the client's details and the items leased to them at present.
e)     Find the client who has been leased at least two items.

## Assignment 6.

Produce an E-R diagram, which documents the entities and relationships involved in the staff management and pay-roll for the employees working in a super market. Create a relational schema to hold information. Identify the tables, perform normalization to the tables and fully implement the code with necessary validations using MS-Access / FOXPRO / DBASE or any other similar package. Provide necessary documentation and coding for the project.
Note: Assumptions can be made wherever necessary

**Assignment 7.**

The NBA (NDHU Basketball Association) is in dire need of a database in order to keep track of the activities in their league.

The entities in the database are

> **People** (with attributes **id**, **name** and **age**),
> **Teams** (with attributes **team name** and **manager**), and
> **Courts** (with attributes **court id**, **address** and **capacity**).

Furthermore, people are specialised into **Referees** and **Players**.

> **Referees** have the extra attribute **level** and
> **Players** have the extra attribute **height**.
> **Players** play in **teams**, and **teams** and **referees** participate in a game that takes place in a court on a certain date.

This league is quite violent and very often players are fouled out by referees. This causes bad relationships between teams and referees and some teams disqualify some referees from refereeing their games.

Some way of recording each game is also required. This will need to store the home and away teams scores.

No player plays for more than one team. Only one game is played on one court on any one day.

a) Produce a set of normalised entities to 1NF. *Add attributes as you think they are required.*
b) Create an ER diagram that models the relationships in the system.

**Assignment 8.**

**Normalization of the CAR_SALE Table.**
The purpose of this exercise is for you to demonstrate your ability to take a database schema and convert it up through the Third Normal Form. Upon completion of this exercise you will have:

a)      Listed the functional dependencies for a database schema
b)      Explained why a specific schema is not in Second or Third Normal Form
c)      Normalized a given schema into the Third Normal Form

The below scenario has been created to help you determine the table structures required for

each of the subsequent normalized tables.

## Scenario
You are given the database schema for a car sales database as follows:

## Table Name: CAR_SALE

**ColumnName**   Car_num   Date_sold   Salesman Commission_percent Discount_amt

**KeyType**          Primary                    Primary

Assuming that a car can be sold by multiple salesmen and, therefore, the attributes of ar_num and Salesman {Car_num, Salesman} taken together are the primary key for the relation. In addition, you are told that the date the car sells determines the discount amount and that each salesman has a unique commission rate.

## Directions
To complete exercise one, you should do the following:
a)       Read and complete each of the three steps identified under exercise two
b)       Create a response for each step listed under exercise two
c)       Create your response using MS Word
d)       When appropriate, use the table feature within Word to create your tables.
e)       Save the document as identified in the "Labs" section of the roadmap and upload the file in the course communication space drop-box.

## Step 1
List the functional dependencies in the relation CAR_SALE. Based on the given primary key, decide if the dependency is
a) completely dependent on the primary key (primary keydependency),

b) partially dependent on the primary key (partial key dependency), or

c)dependent on a non-key column (transitive dependency) for each of the Functional Dependencies you list.

## Step 2
Explain why the relation CAR_SALE is not in 2NF or 3NF
## Step 3
Normalize the relation CAR_SALE into 3NF. Show your results by providing the resulting table schemas.

## Assignment 9.

## Exam Administration

Consider the following relation that keeps track of the exams taken by students at a University department:

Exam(studID, studName, courseID, courseTitle, acadYear,
examSession, mark, degreeCourse)

Suppose the following functional dependencies hold on the relation:

studID -> studName, degreeCourse
courseID -> courseTitle
studID, courseID, acadYear, examSession -> mark
studID, courseID -> acadYear, examSession

a) Decompose the relation in smaller relations such that
   – each of the smaller relations is in BNCF with respect to the projection
     of the original dependencies;
   – the decomposition is a loss less join decomposition.

b) Is your decomposition dependency preserving? If your answer is "yes",
argue why. If your answer is "no", show which dependencies have been
lost.

## Assignment 10.

### Wholesale Dealer
Consider the following relation that keeps track of the sales of a wholesale dealer in trousers:

TrousersSold(customerID, customerName, model, size, day, numberSold, price)
Suppose the following functional dependencies hold on the relation:

customerID -> customerName
customerID, model, size, day -> numberSold
model, size -> price
model, price -> size

a) Decompose the relation in smaller relations such that
 – each of the smaller relations is in BNCF with respect to the projection of the original
dependencies;
   –    the decomposition is a lossles join decomposition.

b) Is your decomposition dependency preserving? If your answer is "yes", argue why. If your
answer is "no", show which dependencies have been lost.

## Assignment 11.

### Manufacturing
Consider the following relation that keeps track of the orders placed by a manufacturing
company:

Orders(orderDate, deliveryDate, supplier, partID, material, price).

Suppose the following functional dependencies hold on the relation:

orderDate, supplier -> deliveryDate
partID, supplier, orderDate -> price
partID -> material
material -> supplier.

a) Decompose the relation in smaller relations such that
– each of the smaller relations is in BNCF with respect to the projection

of the original dependencies;
– the decomposition is a lossless join decomposition.

b) Is your decomposition dependency preserving? If your answer is "yes",
argue why. If your answer is "no", show which dependencies have been
lost.


Note Solve the assignments from 12 to 20   through Select as well as through relational
algebra.

Database Schema  for the exercise:

Professor **( ssn** , profname, status, salary)
Course( **crscode** ,crsname,credits)
Taught(**crscode,semester**,ssn)

Assumptions:

   a) Each course has only one instructor in each semester.
   b) All professors have different salaries.
   c) All professors have different names
   d) All courses have different names
   e) Status  can take value from "full","associate" , and "assistant".

## Assignment 12.

Return those professors who have taught "csc6710" but never "csc7710"

## Assignment 13.

Return those professors who have taught "csc6710" and  "csc7710"  in same semester.

## Assignment 14.

Return those professors who have taught "csc6710 " or "csc7710"   but not both.

## Assignment 15.

Return that course  which have never been taught.

## Assignment  16.

Return that courses  that have been taught atleast in two semester.

## Assignment 17.

Return the names of all professors who have ever taught "csc7710".

**Assignment 18.**

Change all credits to 4 for those courses that are taught in semester "f2006:.

**Assignment 19.**

Return the professor who earns second highest salary.

**Assignment 20.**

Delete those professors who have never taught.

**Assignment 21.**

    a)Create a tables Employee with following columns :

Employee

| |
|---|
| Emp _ no integer NOTNULL |
| Emp_fname char(20) NOTNULL |
| Emp_lname char(20) not null |
| Dept_no char(4) null |

    b)Create a table Department with following columns:

Department Table

| |
|---|
| Dept_no char(4) not null |
| Dept_name char(25) not null |
| Location char(30) null |

      c)Create a table project with following columns:

Project table:

| |
|---|
| Project_no char(4) notnull |
| Project_name char(15) not null |
| Budget float null |

      d)Create a table works_on with the following columns:

Works_on table

| |
|---|
| Emp_no integer notnull |
| Project_no char(4) notnull |
| Job char(15) null |

**Assignment 22.**

    a) Using INSERT statement enter the following data in the Employee table:

| Emp_no | Emp_fname | Emp_lname | Dept_no |
|---|---|---|---|
| 25348 | Mathew | Smith | D3 |
| 10102 | Ann | Jones | D3 |
| 18316 | John | Barrimore | D1 |

| | | | |
|---|---|---|---|
| 29356 | James | James | D2 |
| 9031 | Elke | Hansel | D2 |
| 2581 | Elsa | Bertoni | D2 |
| 28559 | Sybill | Moser | D1 |

b) Using INSERT statement enter the following data in the Department  table:

| Dept_no | Dept_name | Location |
|---|---|---|
| D1 | Research | Dallas |
| D2 | Accounting | Seattle |
| D3 | Marketing | Dallas |

c) Using INSERT statement enter the following data in the Project table:

| Project_no | Project_name | Budget |
|---|---|---|
| P1 | Apollo | 120000 |
| P2 | Gemini | 95000 |
| P3 | Mercury | 185600 |

d) Using INSERT statement enter the following data in the works_on  table

| Emp_no | Project_no | Job |
|---|---|---|
| 10102 | P1 | Analyst |
| 10102 | P3 | Manager |
| 25348 | P2 | Clerk |
| 18316 | P2 | Null |
| 29346 | P2 | Null |
| 2581 | P3 | Analyst |
| 9031 | P1 | Manager |
| 28559 | P1 | Null |
| 28599 | P2 | Clerk |
| 9031 | P3 | Clerk |
| 29346 | P1 | Clerk |

**Assignment 23.**

a) See the records of all the tables with SELECT command.
b) List the Employee number of all the clerks.
c) Get the employee numbers for all employees who have a leading job ( Analyst or Manager) in project P1.
d) Get the employee number and first name of all employees whose first name starts with A.
e) Find the employee details having  Maximum salary.

**Assignment 24.**

a) Find the employee details having second highest salary.
b) Insert  the data of a new employee called Jullia Long , whose employee number is 11111. Her department no is not known yet.
c) Change the name of the department of the employee James .The new department name is Sales.

d) Find the employee number for all employees who are clerks or works in Department D3.
e) Create a table Sample and get all the record from employee table with select statement.

**Assignment 25.**

a) Alter table sample , add new column Telephone_no char(12) null.
b) Drop the Column Telephone_no from Sample table.
c) Get the list of all the employee except the employees having emp_no either 10102 or 9031.
d) List the name of the project whose budget lies between 95000 to 12000.
e) Get the names of all the employees whose first name contains the letter "a" as the second character.
f) Get Full details of  all  the employees whose departments are located in Dallas.
g) Get all jobs of the employees.
h) List the project numbers for all the projects employing less than four persons.

# A8-R4 : BASICS OF OS, UNIX AND SHELL PROGRAMMING

## Objective of the Course

The objective of the course is to make students aware of the functioning of a multi-user operating system. This course will serve as a foundation course for the higher level course in Unix. The students are expected to learn the commands while doing practical and emphasis should be given to those switches/options and flags, which are most frequently used in real life.

After completion of the course students will be able to:

- Understand Operating System concepts.
- Use System calls and memory management.
- Use Unix commands and editors.
- Carry out Unix File management and shell programming in Unix.
- Do Network configuration and security management in Unix.

## Outline of Course

| S. No. | Topic | Minimum number of hours |
|--------|-------|-------------------------|
| 1. | Operating System Concepts | 04 |
| 2. | Linux Ideas and History | 01 |
| 3. | Linux Usage Basics | 02 |
| 4. | Running Commands and Getting help | 02 |
| 5. | Browsing the File System | 04 |
| 6. | The X-Window System | 04 |
| 7. | Users, Groups and Permissions | 03 |
| 8. | Advanced Topics in Users, Groups and Permissions | 03 |
| 9. | The Linux file system in-depth | 06 |
| 10. | vim: An advanced text editor | 03 |
| 11. | Standard I/O and Pipes | 02 |
| 12. | Using the bash shell | 03 |
| 13. | Configuring the Bash Shell | 04 |
| 14. | Text Processing Tools | 03 |
| 15. | Shell Programming | 06 |
| 16. | Investigating and Managing Process | 04 |
| 17. | Finding and Processing Files | 02 |
| 18. | Basic System Configuration Tools | 04 |

| | | | |
|---|---|---|---|
| **Lectures** | **=** | **60** | |
| **Practical/tutorials** | **=** | **60** | |
| **Total** | **=** | **120** | |

## Detailed Syllabus

**1. Operating System Concepts**                                                  **04 Hrs.**

Overview of OS. System Calls, Process Management, Memory Management, Disk and filesystems, Networking, Security, Graphical User Interface, Device Drivers.

## 2. Linux Ideas and History                                              01 Hrs.
What is Open Source? , Linux Origins, Red Hat Distributions, Linux Principles

## 3. Linux Usage and Basics                                                02 Hrs.
Logging in to a Linux System, Switching between virtual consoles and the graphical environment, Elements of the X Window System, Starting the X server, Changing your password, The root user, Changing identities, Editing text files.

## 4. Running Commands and Getting Help                                     02 Hrs.
Running Commands, Some Simple commands, Getting Help, The whatis command, The –help Option, Reading Usage Summaries, The man command, Navigating man pages, The info command, Navigating info pages, Extended Documentation, Red Hat Documentation.

## 5. Browsing the File System                                             04 Hrs.
Linux File Hierarchy Concepts, Some Important Directories, Current Working Directory, File and Directory Names, Absolute and Relative Pathnames, Changing Directories, Listing Directory Contents,  Copying Files and Directories, Copying Files and Directories: The Destination, Moving and Renaming Files and Directories, Creating and Removing Files, Creating and Removing Directories, Using Nautilus, Determining File Content.

## 6. The X-Window System                                                   04 Hrs.
XOrg: The X11  Server, XOrg Server  Design, XOrg  Server Configuration, XOrg Modularity, Server and Client Relationship, XOrg in runlevel 3, XOrg in runlevel 5, Configuration Utilities, Remote X Sessions.

## 7. Users, Groups and Permissions                                         03 Hrs.
Users, Groups, Linux File Security, Permission Precedence, Permission Types, Examining Permissions, Interpreting Permissions, Changing File Ownership, Changing Permissions – Symbolic Method, Changing Permissions – Numeric Method, Changing Permissions – Nautilus

## 8.  Advanced Topics in Users, Groups and Permissions                     03 Hrs.
User and Group ID Numbers, /etc/passwd, /etc/shadow and /etc/group files, User Management   tools, System Users and and Groups, Monitoring Logins, Default Permissions, Special Permissions for Executables, Special Permissions for Directories.

## 9. The Linux File System In-depth                                        06 Hrs.
Partitions and Filesystems, Inodes, Directories, Inodes and Directories, cp and inodes, mv and inodes, rm and inodes, Hard Links, Symbolic ( or soft) Links, The Seven Fundamental Filetypes, Checking Free Space, Removable Media, Mounting CDs and DVDs, Mounting USB Media, Mounting Floppy Disks, Archiving Files and Compressing Archives, Creating, Listing and Extracting File Archives, Creating File Archives: Other Tools.

## 10. vim: An Advanced Text Editor                                         03 Hrs.
Introducing vim, vim: A Modal Editor, vim basics, Opening a file in vim, Modifying a file, Saving a file and exiting vim, Using Command Mode, Moving around, Search and Replace,

Manipulating Text, Undoing changes, Visual Mode, Using multiple "windows", Configuring vi and vim, Learning more.

## 11. Standard I/O and Pipes                                                02 Hrs.
Standard Input and Output, Redirecting Output to a File, Redirecting STDOUT to a Program(Piping), Combining Output and Errors, Redirecting to Multiple Targets (tee), Redirecting STDIN from a file, Sending Multiple Lines to STDIN.

## 12. Using the Bash Shell                                                   03 Hrs.
Bash Introduction, Bash Heritage and Features, Command Line Shortcuts, History Tricks, Command Line Expansion, Command Editing Tricks, gnome-terminal

## 13. Configuring the Bash Shell                                             04 Hrs.
Bash Variables, Environment variables, The TERM Environment variable, The PATH Environment variable, Some common variables, Aliases, How bash expands a Command Line, Preventing Expansion, Login vs non-login shells, Bash startup tasks: profile, Bash startup tasks: bashrc, Bash exit tasks

## 14. Text Processing Tools                                                  03 Hrs.
Tools for Extracting Text, Viewing File Contents, Viewing File Excerpts, Extracting Text by Keyword, Extracting Text by column, Tools for analyzing text, Gathering text statistics, Sorting Text, Eliminating Duplicate Lines, Comparing Files, Duplicating File Changes, Spell Checking with aspell, Tools for manipulating Text, sed, Special Characters for Complex Searches.

## 15. Shell Programming                                                      06 Hrs.
Scripting Basics, Creating Shell Scripts, Generating Output, Handling Input, Exit Status, Control Structures, Conditional Execution, File Tests, String Tests, for and sequences, continue and break, Using positional parameters, handling parameters with Spaces, Scripting at the command line, Shell Script debugging.

## 16. Investigating and Managing Process                                     04 Hrs.
What is a Process? Listing Processes, Finding Processes, Signals, Sending Signals to Processes, Scheduling Priority, Altering Scheduling Priority, Interactive Process management tools, Job Control, Scheduling a Process to execute later, Crontab File format.

## 17. Finding and Processing Files                                           02 Hrs.
Locate, Locate Examples, find, Basic find Examples, find and Logical Operators, find and Permissions, find and Numeric Criteria, find and Access Times, Executing commands with find, find Execution Examples, The GNOME Search Tool.

## 18. Basic System Configuration Tools                                       04 Hrs.
TCP/IP Network Configuration, Managing Ethernet Connections, Graphical Network Configuration, Network Configuration Files, Printing in Linux, Setting the System's Date and Time, Managing Services.

**RECOMMENDED BOOKS**

**MAIN READING**
1. Maurice J. Bach, "Design of the Unix Operating System", Pearson Education,2008.
2. Sumitabha Das, "Unix : Concepts and Applications", Tata McGraw-Hill , 2008.
3. ISRD Group, "Basics of OS, UNIX and SHELL Programming" , Tata McGraw-Hill,2006.
4. Sarwar, Koretsky, and Sarwar, "Unix , The Text Book", Pearson Education, 2007.

**SUPPLEMENTARY READING**
1. Stephen Prata "Advanced Unix -A programmer's Guide"., BPB Publication, 2008.
2. Kochan S & Wood P, "Unix Shell Programming", Pearson Education, 2008.
3. Stevens W R, Rago S.A, "Advanced Programming in Unix Environment", Pearson Education, 2008.

# A8-R4: BASICS OF OS, UNIX AND SHELL PROGRAMMING

## Model Question Paper

**NOTE:**

| | |
|---|---|
| 1. | There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions. |
| 2. | **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book. |
| 3. | Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**. |

**TOTAL TIME: 3 HOURS**                                **TOTAL MARKS: 100**
**(PART ONE-40; PART TWO-60)**

## PART ONE
### (Answer ALL Questions; each question carries ONE mark)

**1.** **Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1 Which one of the following is used to start X server?
- a) startwindow
- b) startx
- c) startxserver
- d) startgui

1.2 Which one of the following lets you know short description of command?
- a) show
- b) descriptor
- c) whatis
- d) none of the above

1.3 Which one of following is used to redirect output to a file while still redirecting to another program?
- a) >
- b) >>
- c) 2>
- d) tee

1.4 What command gives space usage per file system?
- a) df
- b) du
- c) ls
- d) chkdisk

1.5      Linux allows the use of more than one command in one line by specifying the following symbol among the commands:
     a)     ;
     b)     :
     c)     ,
     d)     >

1.6      To copy entire directory structure, we need to use
     a)     cp –s olddir  newdir
     b)     cp –d olddir  newdir
     c)     cp –e olddir  newdir
     d)     cp –r olddir  newdir

1.7      Which one of the following is used to send signal to process?
     a)     sig
     b)     kill
     c)     switch
     d)     None of the above

1.8      Vim is text editor in Linux. Which one is used to redo last undone change in file?
     a)     <shift><ctrl>r
     b)     r
     c)     <ctrl>r
     d)     <ctrl><del>r

1.9      Which one of the following suspends a foreground process?
     a)     <ctrl>s
     b)     <ctrl>r
     c)     <ctrl>z
     d)     <ctrl>x

1.10     File tests are used to test variety of conditions that relate to files on the system. Which one of the following returns true if file is symbolic link?
     a)     –d    <File>
     b)     –e    <File>
     c)     –s    <File>
     d)     –h    <File>

**2.      Each statement below is either TRUE or FALSE.     Identify and mark them accordingly in the answer book.**

2.1      Locate searches file in to current directory by traversing current directory.
2.2      Ctrl + F1 is used to switch from virtual console to graphical environment.
2.3      Nice alters process scheduling priority.
2.4      During opening a files using vim editor, multiple files can be supplied to vim in command line.
2.5      User's name and password are stored in /etc/passwd directory.
2.6      su command is used to change user.
2.7      PATH is an environment variable
2.8      In file system of Linux  .(dot) refers to parent Directory.

2.9    In vi text editor, 5b takes the cursor 5 words backward to the beginning of the word in ex mode.

2.10   Unique command removes all duplicate lines from file.

**3.    Match words and phrases in column X with the nearest in meaning in column Y.**

| | X | | Y |
|---|---|---|---|
| 3.1 | Detail documentation of command | a) | path |
| 3.2 | Directory of all users are located | b) | PS1 |
| 3.3 | Displays absolute path of current directory | c) | help |
| 3.4 | The process who doesn't have parent | d) | diff |
| 3.5 | User's password stored in encrypted form | e) | /etc/passwd |
| 3.6 | File executed when exiting a login shell | f) | /etc/.bash_logout |
| 3.7 | Used to compare two files for differences | g) | man |
| *3.8* | Displays process information. | h) | init |
| 3.9 | Used to compress files and directories | i) | Gzip |
| 3.10 | Local Variable | j) | /home |
| | | k) | ~/.bash_logout |
| | | l) | pwd |
| | | m) | ps |
| | | n) | /etc/shadow |

**4.  Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:**

| (a) | telnet | (b) | ls -l | (c) | time |
|---|---|---|---|---|---|
| (d) | groups | (e) | /etc/startup | (f) | join |
| (g) | passwd | (h) | login | (i) | touch |
| (j) | umask | (k) | In-core inode | (l) | changerootpwd |
| (m) | /etc/profile | (n) | Dir  -per | (o) | head |
| (p) | paste | (q) | PCB | (r) | at |

4.1    _____command is used to change password of root user.

4.2    _____ can be used to change the default access permission of file.

4.3    The _____ command provides output from the beginning of the concerned file.

4.4    _____is used to combines files.

4.5    The command _____can change access time of a file

4.6    _____command is used to see file permissions in current directory.

4.7    Remote login to a machine can be done via _____ command.

4.8    The _____ command provides the facility to schedule a job at a specific time.

4.9    Path of the system wide startup script is _____.

4.10   _____ gives groups you belong to.

## PART TWO
### (Answer any FOUR questions)

**5.**
   a. What is open source? What are the principles of Linux?
   b. List out command line expansion. Using suitable example, explain working of each command line expansion.

**(6 + 9)**

**6.**

a. Write a shell script which takes marks of five subjects as input, finds out the percentage and prints grade of exam. For example
**Input:**
Enter marks of subject:

| Subject1 | 70 |
|----------|----|
| Subject2 | 80 |
| Subject3 | 80 |
| Subject4 | 65 |
| Subject5 | 75 |

**Output:**
Grade: Distinction

b. What are the advantages of having distinct disk partition?

c. What are various commands available in Linux for taking backups? Explain important options of each utility.

**(6 + 4 + 5)**

**7.**

a. Linux provides prompt ($ or #) to execute commands. How does shell expand commands which are typed on prompt?

b. How overwriting and appending can be performed in Linux? Using suitable example, explain how standard error can be redirected?

c. List and explain fundamental file types in Linux. How file type can be obtained?

**(5 + 3 + 7)**

**8.**

a. Write a shell script which finds out whether entered number is prime or not.
**Input:**
Enter Number:  5
**Output:**
Prime Number

b. What do the following commands in "vi" specify? How are they used?
i) map
ii) ? pat
iii) set
iv) ab

c. How does the "login:"prompt appear?

**(5 + 5 + 5)**

**9.**

a. Which command is used to change permission associated to File/Directories? List and explain methods to change permission of File/Directories.

b. What is hard link and soft link? How it can be created?

c. What are the special permissions for executables and directories? What are uses of special permission?

**(5 + 5 + 5)**

# A8-R4 : BASICS OF OS, UNIX AND SHELL PROGRAMMING

## Assignment 1.

Try the following command sequence and write its output:
cd ; pwd ;ls -al ; cd . ;pwd  (where did that get you?) ; cd .. ;pwd ; ls -al ; cd .. ; pwd;ls -al ;cd
.. ;pwd    (what happens now) ;cd /etc ;ls -al | more ;cat passwd ;cd – ;pwd.

## Assignment 2.

   a) Explore the filesystem tree using cd, ls, pwd and cat. Look in /bin, /usr/bin, /sbin, /tmp and /boot. What do you see?
   b) Explore /dev. Can you identify what devices are available? Which are character-oriented and which are block-oriented? Can you identify your tty (terminal) device (typing who am i might help); who is the owner of your tty (use ls -l)?
   c) Explore /proc. Display the contents of the files interrupts, devices, cpuinfo, meminfo and uptime using cat. Can you see why we say /proc is a pseudo-filesystem which allows access to kernel data structures?

## Assignment 3.

   a) Convert the decimal number 192 to octal and hexadecimal using bc command.
   b) Run ps , the script command and run ps again . What is its output. Explain.
   c) Write a command to create following directory structure in one command:
      DOEACC→ALEVEL→AL55…
   d) Create above  Directory Structure with permission 777.?

## Assignment 4.

   a) Run the following command and explain its output
      (i) cd ../.. (ii)mkdir ../bin  (iii)rmdir ..  (iv)ls ..
   b) Write  a  command  to  remove  entire  directory  structure DOEACC/ALEVEL/AL55 in one command?
   c) Run the command tty and note the device name of your terminal. Now run cp /etc/passwd to device name of your terminal. Explain its output.

## Assignment 5.

   a) How does the command mv bar1 bar2 behave , where both bar1 and bar2 are directories, when (i) bar2 exists and (ii)bar2 does not exist
   b) Write a command to display lines common to a.txt and b.txt?
   c) Write a command to display lines unique to a.txt?
   d) Run script command and then issue dir,ls,pwd commands and then run exit. What is its output?

## Assignment 6.

   a) Write a command to compare two text files.
   b) Write a command to copy a file with permission 444.Copy it again and explain your observation.

**Assignment 7.**

      a) Use chmod –w . and then try to create and remove a file in the current directory. What is its output.

      b) Run the commands (i) ls –ld . and (ii) ls –l .. Explain its output.

**Assignment 8.**

Using vi editor write commands to do the following

      a) Combine five lines into a single line.

      b) Search a pattern printf and then repeat the search in opposite direction.

      c) How will you insert /* at the beginning and */ at the end?

**Assignment 9.**

Using vi editor

      a) Write a command to copy line number 1,10 after line number 25.

      b) Write a command to move line number 1,10 after line number 25.

      c) Write a command to copy next 10 lines to a.txt.

**Assignment 10.**

Using vi editor

      a) Write a command to undo last action.

      b) Write a command to create abbreviation  LU as Linux Unix.

      c) Write a command to map ctrl+K to display manual of vi editor.

**Assignment 11.**

      a) Write a command to convert contents of a file a.txt to upper case

      b) Write sequence of commands to convert $1^{st}$ line of a file a.txt to upper case

      c) Write a command to display name of a file in your current directory whose size is maximum.

**Assignment 12.**

      a) Write a command to change modification time of a file without modifying the file.

      b) Write a command to display name of a file in your current directory whose size is maximum.

**Assignment 13.**

      a) We have a file emp.mast which consists of detail of employees in an organization
(Fields are
emp_id,emp_name,dept_name,basic_salary,designation,dob).Write a command to display name of employee who is not director.

      b) Write a command to display name and basic of each employee.

**Assignment 14.**

a) Using at command submit a job at 7 pm.
b) Using batch command submit a job at 7 pm..
c) Delete a job from at queue.
d) Display the listing of jobs in at queue.
e) Write  a command to kill a job.

## Assignment 15.

a) Write a command to display those lines in emp.mast in which 'Training' is present.
b) Write a command to display names of employees in Training Department.
c) Write a command to display number of blank records in a file.

## Assignment 16.

a) Write a command to display contents of a file emp.mast in sorted order on emp_id field.
b) Write a command to display contents of a file emp.mast in sorted order on basic_salary  field.
c) Write a command to display name of the youngest employee .
d) Write a command to create backup of current directory.

## Assignment 17.

a) Write a Shell script to display factorial of a number. Number cannot be blank.
b) Write a Shell script to send mail to all users on your System
c) Write a Shell script to find sum of prime numbers between 2 and 200.

## Assignment 18.

b) Write a Shell script to display sum of digits and number of digits in a number. Number cannot be blank.
c) Write a Shell script /command to display contents of a file in reverse order.
d) Write a Shell script to display sum of prime factors of a number.

## Assignment 19.

a) Write a shell script to create a data entry screen for the file emp.mast created in assignment no-13.
b) Write a shell script to modify records on the basis of emp_id .Emp_id  should be entered by user or command line argument can be used.
c) Write a shell script to insert and delete a record from emp.mast file.[Apply all validations]

## Assignment 20.

a) Write a shell script to generate salary slip of employees (emp_id wise) in file emp.mast by using following formula : Net Salary=Basic+DA+HRA+CCA-EPF.
b) Write a shell script to check spelling in a file and replace misspelled word.

## Assignment 21.

Write a script that compares two directories bar1 and bar2 and copies all files in bar1 to bar2, which are not present in bar2.

**Assignment 22.**

Write a script that checks each minute and reports on who logs in and who logs out.

**Assignment 23.**

Write a script which converts 1$^{st}$ character of each line in a file to uppercase.

**Assignment 24.**

   a) Write a shell function size() which lists only the total size of the files supplied as arguments.
   b) Use the above function to display size of all files in a directory. Directory Name should be supplied at command line.

**Assignment 25.**

Write a shell script to add , modify and delete users without using system administration command.

# A9-R4: DATA COMMUNICATION AND NETWORK TECHNOLOGIES

## Objective of the Course

This course will allow students to develop background knowledge as well as core expertise in data communication and networking (DCN) technologies, which is one of the fastest growing industries in today's world. It forms an integral part of the modern Information and Communications Technology (ICT) in any organizations. Starting from intranet/extranet in small offices to the World Wide Web, principles of DCN play an important role in designing any modern telecom infrastructure.

A major ramification of the fantastic growth of telecommunications and networking is a dramatic increase in the number of professions, where an understanding of DCN is essential for success. Today, students wanting to understand the concepts and mechanisms underlying DCN infrastructures come from a variety of academic and professional backgrounds. Hence, to be useful, a course on DCN infrastructures must be accessible to students without technical backgrounds while still providing technical material comprehensive enough to challenge more experienced readers. This course is designed with this new mix of students in mind.

The course, being the first one on telecommunication and networking in the DOEACC hierarchy, starts from the very basics of communication technology and goes up to the Internet, spanning all the five layers of TCP/IP model. The students will be exposed to communication principles, different types of media, modulation techniques, multiplexing, switched networks, the Internet, TCP/IP suite, network security, mobile wireless communication, fibre-optic communications and the state-of-art networking applications**.**

At the end of the course the students would know:

- Evolution of data communication and networking paradigms
- Principles of data communication, channel characteristics, signaling, modulation and encoding, and multiplexing (SONET/SDH)
- Various transmission media, their comparative study, fibre optics and wireless media
- Categories and topologies of networks (LAN and WAN)
- Layered architecture (OSI and TCP/IP) and protocol suites
- Channel error detection and correction, MAC protocols, Ethernet and WLAN
- Details of IP operations in the INTERNET and associated routing principles
- Operations of TCP/UDP, FTP, HTTP, SMTP, SNMP, etc.
- Strategies for securing network applications in enterprises
- Emerging technologies, such as WDM mesh, mobile telephony etc

**Outline of Course**

| S. No. | Topic | Minimum number of hours |
|---|---|---|
| 1. | Data Communications | 06 |
| 2. | Communication Network Fundamentals | 08 |
| 3. | Media Access Control | 06 |
| 4. | Networking Components | 06 |
| 5. | Link Control and MAC Protocols | 05 |
| 6. | Local Area Networks (LAN) | 05 |
| 7. | Wide Area Networks (WAN) | 08 |
| 8. | Application Protocols | 08 |
| 9. | Wireless Networks | 03 |
| 10. | Security and Management | 05 |

| | | | |
|---|---|---|---|
| **Lectures** | **=** | **60** | |
| **Practical/tutorials** | **=** | **60** | |
| **Total** | **=** | **120** | |

**Detailed Syllabus**

**1. Data Communications**                                                      **06 Hrs.**

Introduction, Communication Systems, Signal and data, Transmission modes, Synchronous and asynchronous transmission, Circuits, channels and multichanneling, Signaling, Encoding and decoding, Error detection and Recovery, Flow control, Sliding Window, Congestion Management, Multiplexing [FDM, TDM, CDM, WDM] and Spreading [DS. FH], Concept of Modulation, Baseband versus Broadband; Pulse Code Modulation (PCM), Shift Keying [ASK, FSK, PSK, QPSK, DPSK]; Encoding techniques and CODEC; Classification of Modems, Standards and Protocols, Protocols used by Modem to Transfer files, Establishing a Connection (Internet connectivity); Digital Subscriber Loop (DSL)

**2. Communication Network Fundamentals**                                       **08 Hrs.**

Introduction, Switching techniques: Circuit Switching, Packet switching, Datagram, Virtual circuit and Permanent Virtual Circuit, Connectionless and connection oriented communication, Message switching, Cell switching (ATM); Telephone network signaling Network topologies, Layering the communication process, Open Systems Interconnection (OSI) model, Data encapsulation; Protocols, services and layering, PDU/SDU; TCP/IP suite, Hour-glass model, Internet Architecture and Protocol overview.

**3. Media Access Control**                                                     **06 Hrs.**

Introduction, Access Techniques (STDM, FDMA, TDMA, Spread Spectrum techniques and CDMA, DSSS, FHSS); Media Access Control: Aloha and Slotted Aloha, Media Access Control Address, Polling, CSMA, CSMA/CA, CSMA/CD and Reservation Aloha, Digital hierarchies [SONET/SDH]

**4. Network Components**                                                       **06 Hrs.**

Introduction, LAN Hardware, LAN Operating Systems, Transmission Media: Guided Media (Twisted pair, Co-axial cable, Optical fiber); Unguided Media (Radio, VHF, microwave, satellite, Infrared); Fiber Optics Communication Components (Source, Channel Detector.
.

## 5. Link Control and MAC Protocols                                05 Hrs.
Framing, Error Detection and Correction; Window-based Flow Control; Logical Link Control, HDLC Protocol, Point-to-Point Protocol (PPP), X.25 CCITT standard for packet data transmission; Media access control, Random Access Techniques, Scheduling Mechanisms.

## 6. Local Area Network (LAN)                                        05 Hrs.
LAN topologies and protocols; IEEE 802 Standard; Ethernet (Standard, Fast, Gigabit), Token Ring, FDDI, Wireless LANs (802.11x);
Connecting LANs: Repeaters, Bridges, Switches, Routers; Virtual LANs

## 7. Wide Area Network (WAN)                                         08 Hrs.
Network Layer Addressing and Routing concepts (Forwarding Function, Filtering Function); Routing Methods (Static and dynamic routing, Distributed routing, Hierarchical Routing); Distance Vector Protocol, Link State protocol, Open Shortest Path First (OSPF);
Internet Protocol (IP): Addressing & Routing; Internet Control Message Protocol, (ICMP), Address Resolution Protocol (ARP), Dynamic Host Control Protocol (DHCP), Network Address Translation (NAT), IPv6, Mobile IP
Process-to-Process delivery in Transport Layer: User Datagram Protocol (UDP), Transmission Control Protocol (TCP), congestion control

## 8. Application Protocols                                           08 Hrs.
Client/Server Model, Network File System (NFS), Remote Login: Telnet; File Transfer Protocol (FTP), Trivial File Transfer Protocol (TFTP); E-mail system: Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP); World Wide Web (WWW), Domain Name System (DNS), DNS servers; Hyper Text system: Hyper Text Transfer Protocol (HTTP), Hyper Text markup Language (HTML)

## 9. Wireless Networks                                               03 Hrs.
Radio Communications, Cellular Radio, Mobile Telephony (GSM & CDMA), Satellite Networks (VSAT), Mobile Adhoc Networks (MANET).

## 10. Security and Management                                        05 Hrs.
Cryptography, IPsec, SSL/TLS, PGP, secure HTTP, proxy, firewall, VPN; Simple Network Management Protocol (SNMP), Network policies.

**RECOMMENDED BOOKS**

**MAIN READING**

1. Behrouz A  Forouzan, "Data Communication and Networking",  Tata McGraw-Hill, 2008
2. William Stallings, "Data and Computer Communications",  Pearson Education, 2008.
3. Rajneesh Agrawal and Bharat Bhushan Tiwari, "Data Communication and Computer Networks", Vikas Publishing house Ltd. , 2005.
4. Tomasi Wayne, "Introduction to Data Communications and Networking", Pearson Education, 2007.

**SUPPLEMENTARY READING**

1. A. S. Tanenbaum, "Computer Networks", Fourth Edition,  Pearson Education.
2. A. Leon-Gracia and I. Widjaja, "Communication Networks", Tata McGraw Hill, 2004.
3. K. Pahlavan and P. Krishnamurthy, "Principles of Wireless Networks", EEE/ Prentice Hall of India, 2003.

## A9-R4: DATA COMMUNICATION AND NETWORK TECHNOLOGIES

## Model Question Paper

**NOTE:**

| | |
|---|---|
| 1. | There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions. |
| 2. | **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book. |
| 3. | Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**. |

**TOTAL TIME**: 3 HOURS

**TOTAL MARKS: 100**
**(PART ONE - 40; PART TWO - 60)**

## PART ONE
### (Answer ALL Questions; each question carries ONE mark)

**1.** **Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1 The physical layer most popularly used in wired LANs nowadays uses
   a) UTP cables
   b) STP cables
   c) Coaxial cables
   d) Radio Frequency

1.2 Seamless networking refers to
   a) A complete end-to-end digital network.
   b) Use of a single platform for end-to-end communication where geographical distance between communicating entities is hidden to the end user.
   c) Use of a single platform for end-to-end communication where geographical distance between communication entities is visible to the end user.
   d) Use of a single platform to transmit data, audio and video.

1.3 Router operates in
   a) Data Link Layer
   b) Network Layer
   c) Transport Layer
   d) All of the above

1.4 Flow control in OSI model is done by
   a) Data link layer
   b) Network layer
   c) Transport layer
   d) Both data link and transport layer

1.5    Which of the following keeps track of the individual units of data (called packets) that a message is divided into for efficient routing through the Internet.
a)    Address Resolution Protocol (ARP)
b)    Internet Protocol (IP)
c)    Hypertext Transfer Protocol (HTTP)
d)    Transmission Control Protocol/Internet Protocol (TCP/IP)

1.6    A brute force attack against an encryption system:
a)    is known as RC4
b)    is also known as 3DES
c)    tries to gain access by trying every possible key
d)    always uses the Rijndael algorithm

1.7    In FDDI, data normally travels on
a)    Primary ring
b)    Secondary ring
c)    Both rings
d)    Neither ring

1.8    In Cellular Mobile Communication handoff means
a)    to disturb the signal
b)    to disturb the antenna
c)    to switch to a new channel when call is in progress
d)    to switch off the MTSO

1.9    The _____ sublayer is responsible for the operation of the CSMA/CD access method and framing.
a)    LLC
b)    MII
c)    MAC
d)    None of the above

1.10    Light is confined within the core of a simple optical fiber by _____.
a)    refraction
b)    total internal reflection at the outer edge of the cladding
c)    total internal reflection at the core cladding boundary
d)    reflection from the fiber's plastic coating

**2.    Each statement below is either TRUE or FALSE.    Identify and mark them accordingly in the answer book**

2.1.    Executable files can be transmitted using SMTP.
2.2.    RSA is a secret key encryption algorithm.
2.3.    IPv6 uses 16 bit addresses.
2.4.    The remote controls of TVs, VCRs and Stereo use Radio waves.
2.5.    Ethernet uses variables sized packets to transmit data.
2.6.    TCP/IP is the protocol suite for Internet.
2.7.    Encryption and decryption are the functions of the presentation layer.
2.8.    Coaxial cable provides data rates over 10 Mbps and frequencies upto 400 MHz.
2.9.    Synchronous transmission is known as start/stop transmission.
2.10.    UTP Category 3 can be used in Fast Ethernet networks.

**3.** **Match words and phrases in column X with the nearest in meaning in column Y.**

| | X | | Y |
|---|---|---|---|
| 3.1 | Release of message contents and traffic analysis | a) | Attenuation |
| 3.2 | Provides a wireless link between a LAN hub and a mobile data terminal equipped with an antenna | b) | Active attacks |
| 3.3 | Gradual weakening of a signal over distance | c) | nomadic access |
| 3.4 | Go-back-N ARQ | d) | Trunks |
| 3.5 | Branches between exchanges | e) | Passive attacks:. |
| 3.6 | Connect dissimilar networks. | f) | SONET |
| 3.7 | Phase modulation | g) | TFTP |
| 3.8 | Fiber Optics technology for transmitting high-speed data | h) | sliding-window flow control |
| 3.9 | File transfer protocol | i) | angle modulation |
| 3.10 | Division of network into smaller networks | j) | router |
| | | k) | SNMP |
| | | l) | Spectrum |
| | | m) | Subnetting |

**4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:**

| (a) CDMA | (b) PDU | (c) FTP | (d) Isotropic antenna |
|---|---|---|---|
| (e) Full-duplex operation | (f) Baud rate | (g) Bandwidth | (h) ICMP |
| (i) FTAM | (j) Direct Sequence Spread Spectrum | (k) Manchester | (l) FIFO queueing |
| (m) Weighted fair queuing | | | |

4.1. _____takes into account the amount of traffic through each queue and gives busier queues more capacity without completely shutting out less busy queues.

4.2. Standard Ethernet (10-Mbps) uses _____ encoding.

4.3. With_____, a station can transmit and receive simultaneously

4.4. An_____ is a point in space that radiates power in all directions equally.

4.5. With _____, each bit in the original signal is represented by multiple bits in the transmitted signal, using a spreading code.

4.6. _____ allows multiple users to transmit over the same wireless channel using spread spectrum.

4.7.  A _____ is the combination of data from the next higher communications layer and control information.

4.8. _____ is  the difference between highest and lowest frequencies of a composite signal.

4.9. _____ is a reporting protocol for the IP addressing.

4.10. The _____ protocol is used to transfer , accessand manage files.

**5.**

    a. What is meant by simplex, half duplex and full duplex communication system? Give representative examples of each.

    b. What is the purpose of cladding in an optical fiber? Discuss its density with respect to the core.

    c. Define forwarding function. Explain its significance with the help of suitable example.

                                      **(5+5+5)**

**6.**

    a. Compare the IEEE standards 802.2, 802.3, 802.4, 802.5 and 802.6 briefly.

    b. Explain the difference between pure ALOHA and slotted ALOHA and draw diagrams for them.

    c. What is high speed LANs? Describe briefly the various types of High-speed LANs used in computer communication networking.

                                        **(5+5+5)**

**7.**

    a. What advantages does TCP have over UDP? What are the features, which make TCP a reliable protocol?

    b. What is static routing? How does it differ from dynamic routing? Discuss the problem of count to infinity associated with distance vector routing technique.

                                          **(7+8)**

**8.**

    a. Compare and contrast three key long distance communication technologies, namely X.25, frame relay and ATM.

    b. Why is it important for protocols configured on the top of Ethernet to have a length field in their header, indicating how long the message is? Discuss what kinds of problems arise when two computers on the same Ethernet share the same MAC (hardware) address.

    c. Routers, bridges and repeaters are used to connect differing networks. Under what circumstances would each of these technologies be used?

                                        **(6+5+4)**

**9.**     Write short notes on any three:

    a. SNMP

    b. VPN

    c. SONET

    d. Novell Netware

                                        **(5+5+5)**

# A9-R4: DATA COMMUNICATION AND NETWORK TECHNOLOGIES

**Assignment 1.**

What is the load on simple ALOHA system in packet/sec, with a data rate of 9600 bps, packet size of 804 bits and G=0.75
{Where G is total rate of data presented to network for transmission or simply offered load}

**Assignment 2.**

Explain the steps involved in computing the checksum for a given message frame:
    Data Polynomial D(x)  = 10011101010101100000
    Generator polynomial G(x) =$x^4$ + $x^3$ + 1

   Find the complete frame bit pattern for data  given above.
       [Hint :  FCS will be 0101 ]

**Assignment 3.**

Explain the steps involved in computing the checksum for a given message frame
    Data Polynomial D(x)  = 11001010101
    Generator polynomial G(x) =$x^4$ + $x^3$ + x + 1

**Assignment 4.**

A 1-km-long, 10-Mbps CSMA/CD LAN (not 802.3) has a propagation speed of 200 m/μsec. Repeaters are not allowed in this system. Data frames are 256 bits long, including 32 bits of header, checksum, and other overhead. The first bit slot after a successful transmission is reserved for the receiver to capture the channel in order to send a 32-bit acknowledgement frame.        What        is        the        effective        data        rate, excluding overhead, assuming that there are no collisions?

**Assignment 5.**

Calculate the baud rate for given bit rate and type of modulation
   a)  2000 bps, 4-PSK
   b)  4000 bps, 8-PSK
   c)  4000 bps, 4-QAM

**Assignment 6.**

Calculate the bit rate for given baud rate and type of modulation
   a)  2000 baud, ASK
   b)  1000 baud, 8 PSK
   c)  1000 baud, 16 QAM

**Assignment 7.**

How many amplitude levels are there for each of the following methods
   a)  unipolar
   b)  NRZ-L
   c)  NRZ-I

d) Manchester

## Assignment 8.

Show the signal diagram (time domain graph) using following methods, for the data stream
**10010110**
a) RZ
b) NRZ-L
c) NRZ-I
d) Differential Manchester

## Assignment 9.

Show the signal diagram (time domain graph) using following methods, for the data stream
**1101000110**
a) QAM
b) 4-PSK
c) PSK
d) Bipolar AMI

## Assignment 10.

What is the maximum data rate, for a typical telephone line with a signal-to-noise ratio of 30dB and an audio bandwidth of 3kHz?

## Assignment 11.

A line has signal-to-noise ratio of 1000 and a bandwidth of 4000 kHz. What is the maximum data rate supported by this line?

## Assignment 12.

A digital signal has a bit rate of 2000 bps. What is duration of each bit (bit interval)?

## Assignment 13.

What is the minimum interval that retransmit timer can be set at, given the channel transmission capability of 20kb/s and propagation delay of 2ms.

## Assignment 14.

Explain why channel efficiency of message switching is greater than circuit switching?

## Assignment 15.

Configure the PC with first useable class C private IP address and subnet mask.

## Assignment 16.

Write a program to simulate slotted controlled ALOHA. Each station should monitor the channel load and increment its value of $\alpha$ by X percent whenever $G < 1$ and decrement it by

the same amount if G > 1. Assume negligible propagation delay. Examine how value of X affects system performance.

**Assignment 17.**

Write a program to simulate routing using flooding. Each packet should contain a counter that is decremented on each hop. When the counter gets to zero, the packet is discarded. Time is discrete, with each line handling one packet per time interval. Make three versions of the program:

a) all lines are flooded
b) all lines except the input line are flooded
c) only (statically chosen) best *k* lines flooded.
   Compare flooding with deterministic routing (k=1) in terms of delay bandwidth used.

**Assignment 18.**

A channel has a bit rate of 4 kbps and a propagation delay of 40msec. For what range of frame sizes does stop-and-wait give an efficiency of at least 60%?

**Assignment 19.**

Identify the OSI layer in which the following protocols work:
      NFS, ICMP, NAT, PPP, X.25, SMTP, SSL, SONET

**Assignment 20.**

Give     the     port     number     on     which     the     following     protocols     work.
TFTP, FTP, SMTP, DNS, DHCP, ICMP.

**Assignment 21.**

Decrypt the following message which was encrypted using shifted alphabet cipher

       f(a) = (a + 4)  mod 26

       **X L M W T V S F P I Q K E Z I Q I E L I E H E G L I**

**Assignment 22.**

Write a program to break monoalphabetic substitution ciphers consisting of English prose (uppercase letters only). The program should compute single letter, digram, trigram frequencies of ciphertext, make guesses about which letter is which, and see if they lead to reasonable plaintext digrams and trigrams. The program should output the plaintext.

**Assignment 23.**

Configure the topology (given below) to establish a peer-to-peer network.

PC-PT
PC0

PC-PT
PC1
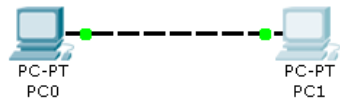
## Assignment 24.

Configure the topology (given below) to establish a switch-based network. After configuring the IP address and suitable subnet mask, ping PC1 to PC0



2950-24
Switch 1

PC-PT
PC Name : PC0

IP - 192.168.1.2

PC-PT
PC Name :PC1

IP - 192.168.1.3
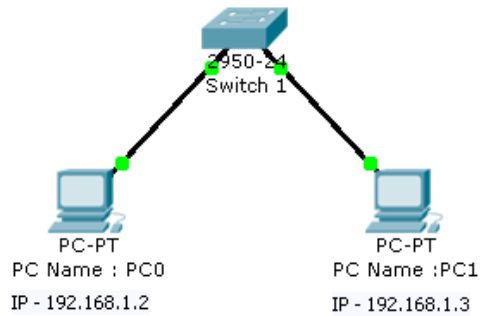
## Assignment 25.

Configure the topology (given below) to establish a network. After configuring the IP address and suitable subnet mask, ping PC1 to PC3



2950-24
Switch 1

PC-PT
PC Name :PC3
IP - 192.168.1.41

Hub-PT
Hub 1

PC-PT
PC Name : PC0
IP - 192.168.1.2

PC-PT
PC Name :PC1
IP - 192.168.1.3

## Objective of the Course

The course is designed to impart knowledge and develop skills required to solve real world problems using object oriented approach, Java Language constructs and Unified Modelling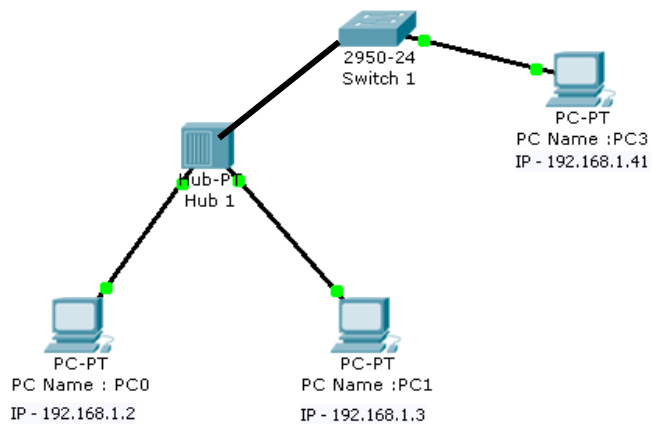 Language. This course covers the subject in 3 sections, viz, Introductions to Object Oriented Programming, Introduction to Java Programming Language, Introduction to UML.

After the completion of the course the student is expected to understand:
- Basics of Object Oriented Programming.
- Various Object Oriented programming concepts - Abstraction, Objects and Classes, Inheritance, Polymorphism.
- Basic data structures in Java, Objects and Classes , Super Class, sub-class, Interfaces, Inner classes.
- GUI programming using AWT/Swing.
- Deploying Java Applications.
- Accessing Databases in Java.
- What is unified Modeling Language and Why is it used.
- Using Class, Interface, Interaction, State and Activity, Physical diagrams in modeling software.

## Outline of Course

| S. No. | Topic | Minimum number of hours |
|--------|-------|--------------------------|
| 1. | Introduction to Object Oriented Programming | 14 |
| 2. | Introduction to Java programming Language. | 32 |
| 3. | Introduction to UML. | 14 |

| | | | |
|---|---|---|---|
| **Lectures** | **=** | **60** | |
| **Practical/tutorials** | **=** | **60** | |
| **Total** | **=** | **120** | |

## Detailed Syllabus

**1. Introduction to Object Oriented Programming**            **14 Hrs.**

1) Thinking Object-Oriented         **(1 Hr.)**
- Why Is OOP Popular? A New Paradigm,  A Way of Viewing the World.
- Why Is OOP Popular? A New Paradigm,  A Way of Viewing the World.

2) Abstraction         **(1 Hr.)**
- Layers of Abstraction, Other Forms of Abstraction.

3) Classes and Methods         **(1 Hr.)**
- Encapsulation, Class Definitions, Methods.

4) Messages, Instances, and Initialization                    **(2 Hrs.)**
     • Message-Passing Syntax, Statically and Dynamically Typed Languages, Accessing the Receiver from Within a Method, Object Creation, Pointers and Memory Allocation, Constructors{Constant Values}, Destructors and Finalizers.

5) Inheritance and Substitution                    **(3 Hrs.)**
     • An Intuitive Description of Inheritance, Inheritance in Various Languages, [Subclass, Subtype, and Substitution], Overriding and Virtual Methods, Interfaces and Abstract Classes, Forms of Inheritance, The Benefits of Inheritance, The Costs of Inheritance. Examples (Language independent)

6) Static and Dynamic Behavior                    **(1 Hr.)**
     • Static versus Dynamic Typing, Static and Dynamic Classes, Static versus Dynamic Method Binding.

7) Multiple Inheritance                    **(1 Hr.)**
     • Inheritance as Categorization, Problems Arising from Multiple Inheritance, Inner Classes.

8) Polymorphism and Software Reuse                    **(1 Hr.)**
     • Polymorphism in Programming Languages, Mechanisms for Software Reuse, Efficiency and Polymorphism, Will Widespread Software Reuse Become Reality?

9) Overloading and Overriding                    **(3 Hrs.)**
     • Type Signatures and Scopes, Overloading Based on Scopes, Overloading Based on Type Signatures, Redefinition, Notating Overriding, Replacement versus Refinement, Deferred Methods, Overriding versus Shadowing, Covariance and Contra variance.

## 2) Introduction to Java Programming Language                    32 Hrs.

1) An Introduction to Java                    **(1 Hr.)**
     • Java as a Programming Platform, The Java "White Paper" Buzzwords, Java and the Internet, A Short History of Java, Common Misconceptions About Java.

2) The Java Programming Environment                    **(1 Hr.)**
     • Installing the Java Development Kit, Choosing a Development Environment, Using the Command-Line Tools, Using an Integrated Development Environment, Compiling and Running Programs from a Text Editor, Running a Graphical Application, Building and Running Applets.

3) Fundamental Programming Structures in Java                    **(2 Hrs.)**
     • A Simple Java Program, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays.

4) Objects and Classes                    **(2 Hrs.)**
     • Introduction to Object-Oriented Programming, Using Predefined Classes,

Defining Your Own Classes, Static Fields and Methods, Method Parameters, Object Construction, Packages, Documentation Comments, Class Design Hints.

## 5) Inheritance                                                    **(2 Hrs.)**
- • Classes, Superclasses, and Subclasses, Object: The Cosmic Superclass, Generic ArrayLists, Object Wrappers and Autoboxing, Reflection, Enumeration Classes, Design Hints for Inheritance.

## 6) Interfaces and Inner Classes                                   **(2 Hrs.)**
- • Interfaces, Object Cloning, Interfaces and Callbacks, Inner Classes, Proxies.

## 7) Introduction to GUI                                            **(2 Hrs.)**
- • AWT Architecture, Light-Weight vs Heavy-Weight, AWT Event Model, AWT Event Hierarchy & Event Handling, Using Top-Levels, components and containers, Introduction to Layouts, Focus Architecture.

## 8) Graphics Programming                                           **(4 Hrs.)**
- • Java2D Rendering Model, Strokes & Fills, Geometries, Fonts and Text Layout, Transformations, Display and manipulation of Images and offscreen buffers, Using Color, Printing through Java, Doing More with Images using Image IO, Hardware Acceleration and Active Rendering techniques.

## 9) User Interface Components with Swing                            **(4 Hrs.)**
- • The Model-View-Controller Design Pattern, Introduction to Layout Management, Text Input, Choice Components, Menus, Sophisticated Layout Management, Dialog Boxes.

## 10) Deploying Applets and Applications                            **(2 Hrs.)**
- • Applet Basics, The Applet HTML Tags and Attributes, Multimedia, The Applet Context, JAR Files, Application Packaging, Java Web Start, Storage of Application Preferences.

## 11) Exceptions and Debugging                                      **(2 Hrs.)**
- • Dealing with Errors, Catching Exceptions, Tips for Using Exceptions, Logging, Using Assertions, Debugging Techniques, Using a Debugger.

## 12) Streams and Files                                             **(3 Hrs.)**
- • The Complete Stream Zoo, ZIP File Streams, Use of Streams, Object Streams, File Management, New I/O, Regular Expressions.

## 13) Database Programming                                          **(5 Hrs.)**
- • The Design of JDBC, The Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions, Advanced Connection Management, Introduction to LDAP.

**3) Introduction to UML**                                              **14 Hrs.**

   1) Introduction, An outline Development Process and Use cases       **(2 Hrs.)**
   - What Is the UML?, How We Got Here, Notations and Meta-Models, Why Do Analysis and Design?, Overview of the Process, Inception, Elaboration, Planning the Construction Phase, Construction, Transition, When to Use Iterative Development, Use Case Diagrams, Business and System Use Cases, When to Use Cases.

   2) Class Diagrams and Advance Concepts                              **(4 Hrs.)**
   - Perspectives, Associations, Attributes, Operations, Generalization, Constraint Rules, When to Use Class Diagrams, Stereotypes, Object Diagram, Class Scope Operations and Attributes, Multiple and Dynamic Classification, Aggregation and Composition, Derived Associations and Attributes, Interfaces and Abstract Classes, Reference Objects and Value Objects, Collections for Multivalued Association Ends, Frozen, Classification and Generalization, Qualified Associations, Association Class, Parameterized Class, Visibility.

   3) Interaction Diagrams, Packages and Collaborations                **(1 Hr.)**
   - Sequence Diagrams, Collaboration Diagrams, Comparing Sequence and Collaboration Diagrams, When to Use Interaction Diagrams, Packages, Collaborations, When to Use Package Diagrams and Collaborations.

   4) State and Activity Diagrams                                      **(1 Hr.)**
   - Concurrent State Diagrams, When to Use State Diagrams, Decomposing an Activity, Dynamic Concurrency, Swimlanes, When to Use Activity Diagrams.

   5) Physical Diagrams                                                **(1 Hr.)**
   - Deployment Diagrams, Component Diagrams, Combining Component and Deployment Diagrams, When to Use Physical Diagrams.

   6) Case Studies                                                     **(5 Hrs.)**

**RECOMMENDED BOOKS**

**MAIN READING**

1. Timothy Budo, "An Introduction to Object-Oriented Programming with Java", Pearson Education, 2009.
2. Martin Fowler,"UML Distilled: A Brief Guide to the Standard Object Modeling Language", 3$^{rd}$ Edition, Pearson Education, 2009.


**SUPPLEMENTARY READING**

1. H. Schildt, "The Complete Reference -Java2", Tata McGraw-Hill, 2008.
2. P. J Dietel and H. M Dietel, "Java How to Program", 7$^{th}$ Edition, Pearson Education, 2008.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modeling Language User Guide", 2$^{nd}$ Edition, Pearson Education, 2009.
4. Wu C Thomas, "Introduction to Object Oriented Programming with Java", 4$^{th}$ Edition, Tata McGraw-Hill, 2008.
5. Balaguruswamy E, "Programming with Java", Tata McGraw-Hill, 2007.
6. Muthu C, "Essentials of Java Programming", 2008, Tata McGraw-Hill, 2007.
7. Bhave M.P, Patekar S.A, "Programming with Java", Pearson Education , 2009.
8. Khurana Rohit , "Object Oriented Programming with C++", Vikas Publishing House.

## A10.1-R4: INTRODUCTION TO OBJECT ORIENTED PROGRAMMING THROUGH JAVA

### Model Question Paper

**NOTE:**

| | |
|---|---|
| 1. | There are **TWO PARTS** in this Module/Paper.  **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions. |
| 2. | **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein.  **PART ONE** is **NOT** to be answered in the answer book. |
| 3. | Maximum time allotted for **PART ONE** is **ONE HOUR**.  Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned.  However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**. |

**TOTAL TIME: 3 HOURS**                                    **TOTAL MARKS: 100**
**(PART ONE-40; PART TWO-60)**

### PART ONE
### (Answer ALL Questions; each question carries ONE mark)

**1.     Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1.    A type of use case relationship that adds new behavior or actions is a(n):
e) generalized relationship
f) extend relationship
g) recursive relationship
h) abstract relationship

1.2.    The technique of hiding internal implementation details of an object best describes:
a) incorporation
b) polymorphism
c) encapsulation
d) generalization.

1.3.    Activity diagrams can be used to show
a) how objects are activated
b) how all the users can interact
c) multithread processing
d) how use cases fit together to achieve business level process

1.4.     Which of the following show the static structure of data and operations those act on the data?
a) use cases
b) class diagram
c) state diagram
d) sequence diagram

1.5.    class ExceptionTest{

```java
public static void main( String sz[] ){
    try{
        int iA = 0;
        int iB = 50 / iA;
    }
    catch(Exception e){
        System.out.print("I am always here");
    }
    catch(ArithmeticException e){
        System.out.print("Am I on Output ever???...");
    }
}
}
```

What will be the output for the code above?
a) I am always here.Am I on Output ever???...
b) Error
c) I am always here.
d) Am I on Output ever???...

1.6.   Which Exception is thrown by the read( ) method of InputStream class?
a) Exception
b) FileNotFoundException
c) ReadException
d) IOException

1.7.   Which of the statement below does not correctly defines the difference between JDBC and ODBC ?
a) ODBC can be directly used with Java because it uses a C interface
b) ODBC makes uses of pointers which has been totally removed from JAVA
c) ODBC is from Microsoft while JDBC is from java applications
d) ODBC requires manual installation of the ODBC driver manager and driver on all client machines. While for JDBC drivers are written in Java and JDBC code is automatically installable, secure and portable on all platforms.

1.8.   Given the following code
```java
import java.awt.*;
public class SetF extends Frame{
public static void main(String argv[]){
 SetF s=new SetF();
 s.setSize(300,200);
 s.setVisible(true);
 }
}
```
How could you set the frame surface color to pink?

a) s.setBackground(Color.pink);
b) s.setColor(PINK);
c) s.Background(pink);
d) s.color=Color.pink

1.9.    Which of the following applet tag is legal to embed an applet class named Test into a webpage?
   a)  <applet param = Test.class  width = 200 height = 200> < /applet >
   b)  <applet code = Test.class  width = 200  height = 200 > < /applet >
   c)  <applet class = Test  width = 200  height = 200></applet >
   d)  <applet>  code = Test.class  width = 200  height = 200 < /applet >

1.10.  State diagrams are being drawn to
   a)  show how objects move between classes
   b)  find missing use cases
   c)  show how an object responds to messages
   d)  show how classes change state over time

**2.    Each statement below is either TRUE or FALSE.    Identify and mark them accordingly in the answer book.**

2.11   A concrete class or an abstract class can only be a parent class.
2.12   Extension is applied to subclass while restriction is applied to superclass.
2.13   Traversing an association is an operation that yields related objects.
2.14   Computing the derived object may change the state of the object.
2.15   The % (modulo) operator can be used with floating point operands.
2.16   A *static* method can be invoked by simply using the name of the method alone.
2.17   Objects are passed to a method by use of call-by-value.
2.18   Abstract class can be a final class.
2.19   Interface can Inherit one or more Interfaces.
2.20   Font[] getAllFonts( ) returns an array of Font objects for all selected fonts.

**3.    Match words and phrases in column X with the nearest in meaning in column Y.**

|  | **X** |  | **Y** |
|---|---|---|---|
| 3.1 | Abstraction | a) | Can be done using Object.Method(Information)prototype. |
| 3.2 | Encapsulation | b) | a-part-of relationship |
| 3.3 | Message Passing | c) | Action |
| 3.4 | Runtime Polymorphism | d) | isa relationship |
| 3.5 | destructor | e) | This information provides us the direction of inheritance |
| 3.6 | Aggregation | f) | This information will guide us in designing classes |
| 3.7 | Actors | g) | Normal objects |
| *3.8* | Association | h) | Functions are automatically called when derived class object gets destroyed |
| 3.9 | Generalization | i) | Dynamic Binding |
| 3.10 | Event | j) | Is a way to provide transparent access to Essential Details |
|  |  | k) | Explicit objects |
|  |  | l) | Can be related to Data Hiding in programming. |

**4.    Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:**

| (a) | event | (b) | data store | (c) | object-Code |
|---|---|---|---|---|---|

| (d) | state | (e) | integer | (f) | deployment |
|-----|-------|-----|---------|-----|------------|
| (g) | default | (h) | polymorphism | (i) | boolean |
| (j) | public | (k) | link | (l) | finalize () |
| (m) | association | (n) | byte-Code | (o) | object class |

4.11 In dynamic model _____ represent interval of time.

4.12 A (n) _____ describe a group of links with common semantics and are inherently bidirectional.

4.13 UML _____ diagram shows where components of distributed system are located.

4.14 _____ is a passive object within a data flow diagram that stores data for later access.

4.15 _____ is the cosmic super class.

4.16 Java compiler produces an intermediate code which is known as _____.

4.17 _____method in java is same as destructor method in c++.

4.18 _____ means the ability that one thing can take several different forms.

4.19 _____ is the data type returned by all relational operators.

4.20 _____ is the default access specifier for class members in Java.


# PART TWO
## (Answer any FOUR questions)

**5.**

a. Mention in brief four aspects of Object Oriented Design and Programming.
b. Encapsulation "protects" the abstractions. Justify the statement.
c. How can encapsulation and polymorphism improve reusability?
d. What are the challenges in designing with inheritance (single/multiple both)?
e. What is UML? What it is not? What is the importance of UML?

**(4+4+4+3+3)**

**6.**

a. A more flexible way to do it is to write a wrapper JDBC Driver that is an intermediary between the client application and database. Explain how to write a wrapper JDBC **Driver** class.
b. Explain the significant language features of java.
c. Which are the Similarities and Differences between java and C++?

**(10+4+4)**

**7.**

a. Write a short note on java access specifiers with examples.
b. Packages and interfaces form a very important concept in Java. Which are the advantages and disadvantages of package and interface?
c. The Java 2D™ API provides two-dimensional graphics, text, and imaging capabilities for Java™ programs through extensions to the Abstract Windowing Toolkit (AWT). List the capabilities of Java 2D™ API.
d. The Pattern class defines an alternate compile method that accepts a set of flags affecting the way the pattern is matched. Explain any four flags of Pattern class.

**(4+6+4+4)**

**8.**

a. The Java language supports special "doc comments". Explain Java Documentation Comment Syntax.

b. Various commands are available in Java Development Kit those can be used to enhance java programming. How various options of *javac* command can be used in java programming?

c. Differentiate between Frozen v/s Read only object, Fork and Join and give example of the same.

d. What are the uses of multiple classification and dynamic classification? How it differs from classification and generalization?

**(4+4+5+5)**

**9.**

a. What does state chart diagram document?

b. Explain Aggregation & Composition with suitable example.

c. How to reduce interface of a package?

d. What do you mean by node? How do you represent it? In which diagram this concept is there?

e. What is the role of a template?

**(5+4+4+3+2)**

**Assignment 1.**

Write a program that can create a concordance ( A concordance lists every word that occurs in the document, and for each word it gives the line number of every line in the document where the word occurs ).The document should be read from an input file, and the concordance data should be written to an output file. The names of the input file and output file should be specified as command line arguments when the program is run.

**Assignment 2.**

Open a text file so that you can read the file one line at a time. Read each line as a String and place that String object into a LinkedList. Print all of the lines in the LinkedList in reverse order.

**Assignment 3.**

Write a Java Program to create three new types of exceptions. Write a class with a method that throws all three. In main( ), call the method but only use a single catch clause that will catch all three types of exceptions.

**Assignment 4.**

Design a Calculator using Java Applet/Swing. The display should have all the digit buttons along with buttons for operations +,-,*, / and =. There is a designated panel to show the current results. If a digit button is clicked, the number is displayed on the panel. If an operator button is clicked the operation is to be performed. The calculator can operate in two modes.
   a.  When, the operator buttons are pressed the intermediate results should be displayed.
   b.  The operations can take in any number of arguments and the final result is displayed only when the = button is pressed.

**Assignment 5.**

Write an applet with a JTextArea where the user can enter some text. The applet should have a button. When the user clicks on the button, the applet should count the number of lines in the user's input, the number of words in the user's input, and the number of characters in the user's input. This information should be displayed on three labels in the applet.

**Assignment 6.**

Write a Java Program to create three interfaces, each with two methods. Inherit a new interface from the three, adding a new method. Create a class by implementing the new interface and also inheriting from a concrete class. Now write four methods, each of which takes one of the four interfaces as an argument. In main( ), create an object of your class and pass it to each of the methods.

**Assignment 7.**

Create an image from an Array of Color-Indexed Pixel Values in the byte buffer. A 16-color index color model is used to represent the pixel colors.

**Assignment 8.**

Write a Java Program to find all the strings that match a given Regular Expression in one or more files or other sources.

**Assignment 9.**

Write a little applet that lets the user draw polygons. As the user clicks a sequence of points, count them and store their x- and y-coordinates in two arrays. These points will be the vertices of the polygon. Also, draw a line between each consecutive pair of points to give the user some visual feedback. When the user clicks near the starting point, draw the complete polygon. Draw it with a red interior and a black border. The user should then be able to start drawing a new polygon. When the user shift-clicks on the applet, clear it.

**Assignment 10.**

Write a Java Program to read from or write to a particular location in a file, such as an indexed file.

**Assignment 11.**

Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.

Create a class **account** that stores customer name, account number and type of account. From this derive the classes "cur_acct" and "sav_acct" to make them more specific to their requirements. Include necessary functions in order to achieve the following tasks:

a)    Accept deposit from a customer and update the balance.
b)    Display the balance.
c)    Compute and deposit interest.
d)    Permit withdrawal and update the balance.
e)     Check for the minimum balance, impose penalty, necessary, and update the balance.

**Assignment 12.**

A hospital wants to create a database regarding its indoor patients. The information to stores include
a)    Name of the patient
b)    Date pf admission
c)    Disease
d)    Date of discharge

Create a base class to store the above information. The base class should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. Write a code to list the information about all the pediatric patients (less than 12 years in age).

**Assignment 13.**

Create the following form using java applet/Swing and the text in textbox should be formatted as per the selections:



**Assignment 14.**

Create table with the following structure:

```
Userid       Character     10
Password     Character     10
Primary Key-Userid
```

Now design a login form(connected to database using jdbc) and show a welcome message if userid and password combination is correct, otherwise display an error message.

**Assignment 15.**

The Indian Airlines has launched a fast transportation service, using their supersonic passenger airplanes. You are hired by the Indian Airlines for maintaining their database. It contains only a single table, called Route, which holds all pairs of cities with a directed connection, the distance between them, and the type of aircraft used for that trip. An example table is given below:

| FromCity | ToCity | Distance (km) | Airplane |
|----------|--------|---------------|----------|
| Chandigarh | N.delhi | 265 | IA300 |
| Mumbai | Goa | 165 | IA200 |
| Mumbai | Pune | 153 | IA100 |
| …… | …… | …… | …… |

Your program should assume that the table already exists in the database and contains data. The structure of the command line to run your program is as follows:

**Java IA Supersonic < queryType > < queryVariable > [toTable]**

Your program should ask the user for login and password, and connect right after to the database, based on the given information.
**< queryType >** is one of the following:
  a) **toCity**:output all services that go to the city specified in **<queryVariable >**
  b) **fromCity:**output all services that go from the city specified in **<queryVariable >**
  c) **airplane:** output all services that use airplane specified in **<queryVariable >**
**[toTable]** is an optional parameter – the user may dump the query result to toTable by stating 'toTable' as an argument, or not specify a 3rd argument at all. In the latter case, the output should be inserted to a table called **IA Result**. In case that it does not exist, **IA Result** should be created by the program, with the same columns as Route. Otherwise, the existing data should be deleted, and the query result should be inserted.

**Assignment 16.**

Create an application that creates a ball which bounces with the help of thread in Graphics.
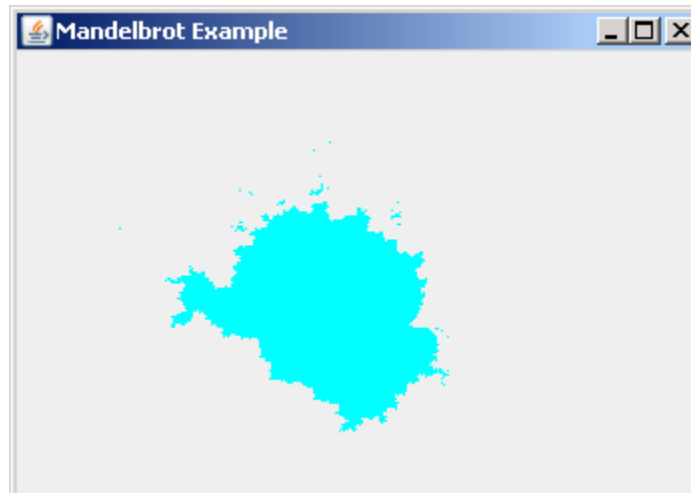
**Assignment 17.**

Create a layout prototype of Ms-Paint in Java swing using menus and layout management. You can also add functionality to some of the menu item/toolbar items.

**Assignment 18.**

Write a program using inheritance that should be able to draw a circle, Ellipse, square, rectangle, parallelogram and a rhombus when relevant dimensions are read in e.g. a circle can be drawn when the centre and the radius is read in, and ellipse can be drawn when the major and minor axis lengths along with the centre is given, a rectangle can be drawn with two sides given and so on.

**Assignment 19.**

Write a java program to draw a Mandelbrot, which is a collection of points in the plane whose boundary forms a fractal.



**Assignment 20.**

Draw   use case diagram for the parking ticket payment system .The information for the system is given below:

       a)     Patrol Officer enters ticket information. (ticket status = unpaid)
       b)     Ticket Holder views her ticket by ticket number. (ticket  status = unpaid)
       c)     Ticket Holder pays for ticket by entering her credit card information. (ticket status = in process)
       d)     Office Staff views all tickets whose status is "in process" to retrieve payment credit card information for each ticket.  (ticket status = in process)
       e)     Office Staff does credit card payment transactions manually.  (ticket status = in process)
       f)     Office Staff change ticket status for each successful payment. (ticket status = paid)

**Assignment 21.**

The following is a partial taxonomy of rotating electrical machines.  Electrical machines may be categorized for analysis purposes into alternating current (ac) or direct current (dc). Some machines run on ac, some on dc, and some will run on either.  An ac machine may be synchronous or induction.   A few examples of electrical machines include large synchronous motors, small induction motors, universal motors, and permanent magnet motors.   Most motors found in the homes are usually induction machines or universal motors.   Universal motors are typically used in where high speed is needed such as in blenders or vacuum cleaners.  They will run on either "AC" or "DC".  Permanent magnet motors are frequently used in toys and will work only on dc.
Prepare an object diagram showing how the categories and the machines just described relate to one another.  Use multiple inheritance where it is appropriate to do so.

**Assignment 22.**

Prepare a class diagram from the instance diagram in the following figure:
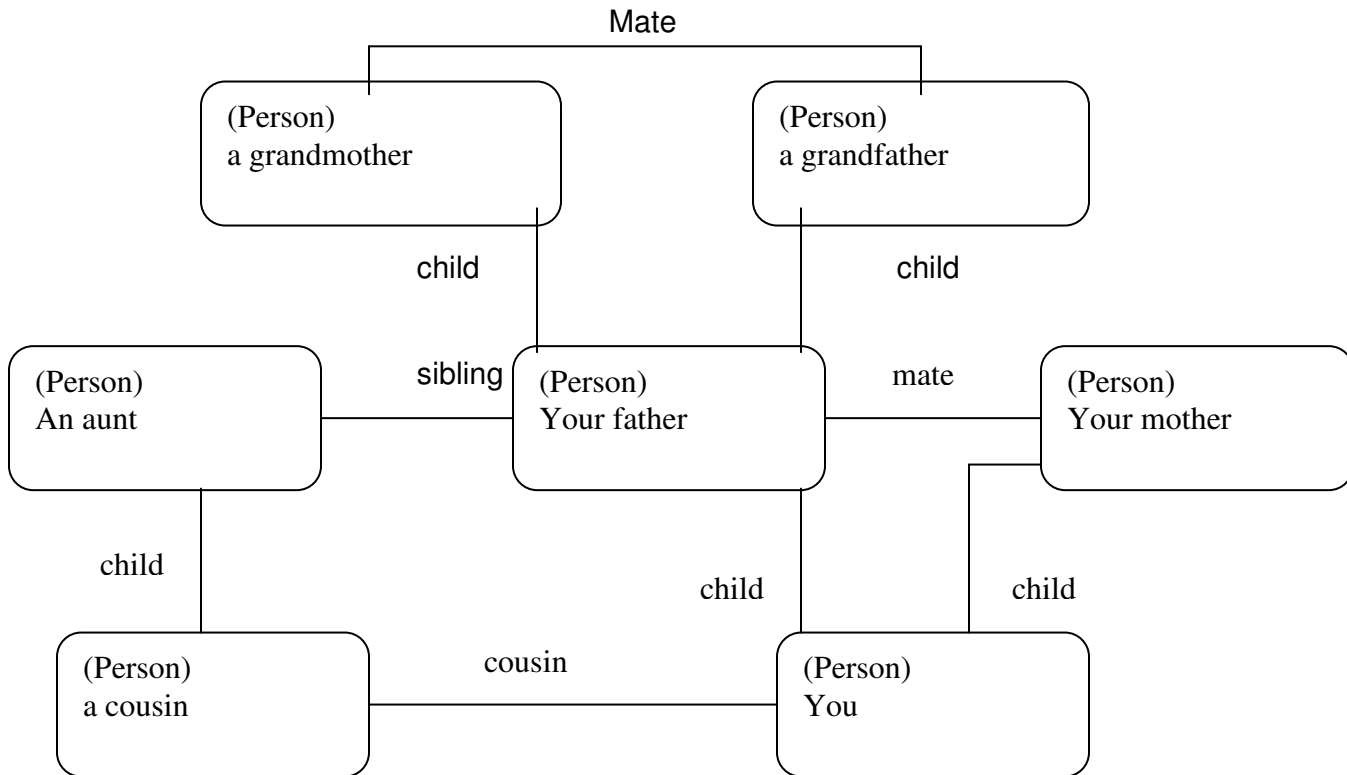


**Assignment 23.**

The direction control for some of the first toy electric trains was accomplished by interrupting the power to the train. Prepare state diagrams for the headlight and wheels of the train, corresponding to the following scenario:

> Power is off, train is not moving.
> Power is turned on, train moves forward and train headlight shines.
> Power in turned off, train stops and headlight goes out.
> Power is turned on, headlight shines and train does not move.
> Power is turned off, headlight goes out.
> Power is turned on, train runs backward with its headlight shining.
> Power is turned off, train stops and headlight goes out.
> Power is turned on, headlight shines and train does not move.
> Power is turned off, headlight goes out.
> Power is turned on, train runs forward with its headlight shining.

**Assignment 24.**

A simple digital watch has a display and two buttons to set it, the "A" button and the "B" button. The watch has two modes of operation, display time and set time. In the display time mode, hours and minutes are displayed, separated by a flashing colon. The set time mode has two sub-modes, set hours and set minutes. The "A" button is used to select modes. Each time it is pressed, the mode advances in the sequence: display, set hours,

set minutes, display, etc.  Within the sub-modes, the "B" button is used to advance the hours or minutes once each time it is pressed.  Buttons must be released before they can generate another event.  Prepare a state diagram of the watch.

**Assignment 25.**

Some combined bath-showers have two faucets and a lever for controlling the flow of the water.  The lever controls whether the water flows from the showerhead or directly into the tub.  When the water is first turned on, it flows directly into the tub.  When the lever is pulled, a valve closes and latches, diverting the flow of water to the showerhead.  To switch from shower to bath with the water running, one must push the lever.  Shutting off the water releases the lever so that the next time the water is turned on, it flows directly into the tub. Write a scenario for a shower that is interrupted by a telephone call.

## Objective of the Course

This objective of the course is to make students aware about the importance of the software testing during software development. The course covered to be in line with the development tools and languages taught in this level. The course will prepare the student for software testing and debugging. It will further laid the foundation for advanced courses in Software quality assurances.

## Outline of Course

| S. No. | Topic | Minimum number of hours |
|---|---|---|
| 1. | Introduction | 02 |
| 2. | Importance of Software Testing | 04 |
| 3. | Testing Techniques and Strategy | 10 |
| 4. | Verification and Validation | 06 |
| 5. | Building Test Cases and Plans | 20 |
| 6. | Quality Assurance and Standards | 10 |
| 7. | Debugging Technique and Tools | 04 |
| 8. | External Source of Errors | 04 |

|   |   |   |
|---|---|---|
| **Lectures** | **=** | **60** |
| **Practical/tutorials** | **=** | **60** |
| **Total** | **=** | **120** |

## Detailed Syllabus

**1. Introduction** **02 Hrs.**
Software program and its objective, Software development techniques, top-down verses bottom-up approach, modular and structures programming. A brief introduction about object oriented approach.

**2. Importance of Software Testing** **04 Hrs.**
Software testing and its importance, software development life cycle verses software testing life cycle, Deliverables, version and error control

**3. Testing Techniques and Strategy** **10 Hrs.**
Unit testing, Integration testing, System testing, Acceptance testing
White-Box testing: Flow Graph notation, Cyclomatic Complexity, Graph matrices, control structure and loop testing.
Black-Box testing: Equivalence partitioning, Boundary Value Analysis, Orthogonal Array testing.

**4. Verification and Validation** **06 Hrs.**
Requirement verification, Coding standards, Walk through, Formal Inspection, Design validation and verification, Function test, Design metrics, correctness proof and its requirement.

## 5. Building Test Cases and Plans                                    20 Hrs.

Format of test cases, Du, dc and other data paths, Test data selection, branch coverage, statement coverage, pre-condition and post-condition, Test schedule and check pointing, suitable exercises for creating test cases for each type of techniques mentioned in para 3.

## 6. Quality Assurance and Standards                                   10 Hrs.

Basic software quality parameters and its metrics, Software Configuration Change and types of errors, Quality management models: ISO, SPICE, IEEE, CMM

## 7. Debugging Technique and Tools                                     04 Hrs.

Integrated development environment, debugging, tracing, data inspection, exception errors, code and data redundancy, unreachable code.

## 8. External Source of Errors                                        04 Hrs.

Main memory, conflicting dll and unknown interface as source of error and their rectification.

**Note:  Any open-source Software Tools may be utilized, such as "winrunner".**

**RECOMMENDED BOOKS**

**MAIN READING**

1. Desikan S, Ramesh G, "Software Testing", Pearson Education, 2008.
2. Tamres L, "Introducing Software Testing", Pearson Education, 2007.
3. Dustin E, "Effective Software Testing", Pearson Education, 2007.
4. Mathur A.P, "Fundamentals of Software Testing", Pearson Education, 2008.

**SUPPLEMENTARY READING**

1. Brian Marick, "The Craft of Software Testing", Pearson Education, 2008.
2. Rajani & Oak, "Software Testing : Methodology, Tools and Processes" Tata McGraw-Hill, 2007.
3. R. Pressman, "Software Engineering", 6th Edition, Tata McGraw-Hill.

# A10.2-R4: SOFTWARE TESTING AND QUALITY MANAGEMENT

## Model Question Paper

**NOTE:**

**TOTAL TIME: 3 Hours**                                                **TOTAL MARKS: 100**
                                                                       **(PART ONE -40; PART TWO-60)**

## PART ONE
### (Answer ALL Questions; each question carries ONE mark)

**1.      Each question below gives a multiple choices of answers. Chose the most appropriate one.**

1.1     Verification is:
        a) Checking that we are building the right system
        b) Checking that we are building the system right
        c) Performed by an independent test team
        d) Making sure that it is what the user really wants

1.2     A regression test:
        a) Will always be automated
        b) Will help ensure unchanged areas of the software have not been affected
        c) Will help ensure changed areas of the software have not been affected
        d) Can only be run during user acceptance testing

1.3     Which of the following could be a reason for a failure
        1) Testing fault
        2) Software fault
        3) Design fault
        4) Environment Fault
        5) Documentation Fault

        a) 2 is a valid reason; 1,3,4 & 5 are not
        b) 1,2,3,4 are valid reasons; 5 is not
        c) 1,2,3 are valid reasons; 4 & 5 are not
        d) All of them are valid reasons for failure

1.4     Test is prioritized so that:
        a) you shorten the time required for testing

b) You do the best testing in the time available
c) You do more effective testing
d) You find more faults

1.5 Which of the following is not a static testing technique
a) Error guessing
b) Walkthrough
c) Data flow analysis
d) Inspections

1.6 During which test activity could faults be found most cost effectively?
a) Execution
b) Design
c) Planning
d) Check Exit criteria completion

1.7 The purpose of requirement phase is
a) To freeze requirements
b) To understand user needs
c) To define the scope of testing
d) All of the above

1.8 The process starting with the terminal modules is called -
a) Top-down integration
b) Bottom-up integration
c) None of the above
d) Module integration

1.9 The inputs for developing a test plan are taken from
a) Project plan
b) Business plan
c) Support plan
d) None of the above

1.10 Inspections can find all the following except
a) Variables not defined in the code
b) Spelling and grammar faults in the documents
c) Requirements that have been omitted from the design documents
d) How much of the code has been covered

**2. Each statement below is either TRUE or False. Identify and mark them accordingly in the answer book.**

2.1 In information technology, we often build products requirements/specifications which although documented not true quality needs of our customers.
2.2 Our products must be corrected so that they will eventually meet our customers' true quality needs.
2.3 Can produce products at our convenience and at any cost
2.4 Quality is not an attribute of product
2.5 Quality is not a binary state
2.6 Quality need not be defined in quantitative terms in order to be measurable.

2.7 Quality can be controlled only if it is measured.

2.8 Non conformance must be detected as early as possible measured.

2.9 High defect prone products and processes are identified testing the product after all processes are over.

2.10 0% of all defects are attributable to incorrect ineffective processes.

## 3.   Match words and phrases in column X with the nearest in meaning in column Y

| | X | Y |
|---|---|---|
| | **X** | **Y** |
| 3.1 | A process of selecting test cases/data by identifying the boundaries that separate valid and invalid conditions | a) Quality Assurance |
| 3.2 | It is based upon graphical representation of the program process | b) Software Configuration |
| 3.3 | The input domain of the system is partitioned into classes of representative values, so that the no of test cases can be limited to one-per-class, which represents the minimum no. of test cases that must be executed. | c) CMM-Managed |
| 3.4 | A planned and systematic set of activities necessary to provide adequate confidence that requirements are properly established and products or services conform to specified requirements | d) Data flow modeling |
| 3.5 | Foundation for continuing improvement and optimization of process | e) Boundary value Analysis |
| 3.6 | The nodes represent the data objects. The links represent the transformations that occur to translate one data object to another. | f) Equivalence testing |
| 3.7 | Computer programs (source code and executables), documentation (technical and user), data (internal and external to programs) | g) Unit Testing |
| 3.8 | Brainstorming meeting, whose goal is to identify the problem, propose elements of a solution, negotiate different approaches, and specify a preliminary set of solution requirements | h) Black Box |
| 3.9 | Iis the process of testing each software component individually using stubs and/or drivers. | i) Control Flow Analysis |
| 3.10 | A technique in which the input domain is divided into classes of equivalent data items | j) Facilitated application specification technique (FAST). |

## 4.   Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:

| (a) Quality control | (b) Design, | (c) Management cycle | (d14 |
|---|---|---|---|
| (e) Customer | (f) Acceptable quality level | (g) Test tools | (h) implementation and test |
| (i) White box | (j) optimising process | | |

4.1 For quality to happen, there must be well-defined standards and procedures which are

followed

4.2 Quality means fit for use. This is _____view.

4.3 The no of principles in Dr. W. Edwards Deming's quality principles is _____.

4.4 The other name PDCA referred to is _____.

4.5 With the_____, the data is available to justify the application of technology to various critical tasks, and numerical evidence is available on the effectiveness with which the process has been applied to any given product

4.6 If changes are not controlled, then orderly _____ is impossible and no quality plan can be effective.

4.7 AQL stands for_____.

4.8 Is a vehicle for performing a test process_____.

4.9 The process by which product quality is compared with applicable standards; and the action taken when nonconformance is detected is called _____.

4.10 cyclomatic Complexity method is one of the method of _____Testing.

## PART TWO
### (Answer ANY FOUR questions)

**5.**
   a. How does software differ from the artifacts produced by other engineering disciplines?
   b. How do software process metrics differ from software project metrics?
   c. What is meant by the term software reliability?

**(5+5+5)**

**6.**
   a. What are the names of the five levels of the SEI Capability Maturity Model? In your own words, briefly describe each.
   b. Describe the change control process for a modern software development project.

**(10+5)**

**7.**
   a. System Testing
   b. What is equivalence partitioning as it applies to software testing?
   c. Boundary Value Analysis
   d. Black box vs. white box testing
   e. Acceptance Testing

**(3+3+3+3+3)**

**8.**
   a. What are the key differences between validation testing goals and acceptance testing goals?
   b. A computer system is required that will support the following small garage business.

   Customers bring their cars to the garage for servicing and repair. The attendant must check the car in, record details about the owner and the car, along with any specific customer requests. The workshop manager inspects each car and creates a job specification for it. He then schedules the job and assigns a mechanic to complete the specified tasks. During this process, if any new problems are discovered a new job specification is created by the workshop

manager before carrying out the work. When the job is finished the mechanic completes a report detailing the time spent, work done and materials used. This information is used by the attendant to create an invoice for the customer when they come to collect their car.

Represent the system described above as a use-case diagram

**(5+10)**

**9.**

a. What is the difference between testing Techniques and tools? Give examples. Quality control activities are focused on identifying defects in the actual products produced; however your boss wants you to identify and define processes that would prevent defects. How would you explain to him to distinguish between QA and QC responsibilities?

b. Describe the process used in the UML (unified modeling language) approach to object-oriented design.

**(10+5)**

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**Assignment 1.**

A program reads three integer values, representing the lengths of the sides if the triangle. The program prints whether the triangle is scalene, isosceles or equilateral. Develop a set of test cases that would test the program adequately.

**Assignment 2.**

Derive a flow graph for the above program and apply basis path testing to develop test cases that will guarantee the execution of all the statements. Execute the cases and show the results.

**Assignment 3.**

Given the following procedure

```
        PROCEDURE AVERAGE
        Interface Returns avg, input, valid
        Interface accepts value, min, max

    int value [100];
    int avg; input, valid, min, max, sum, i

    i = 1;
    input = valid = 0;
    sum = 0
    Do WHILE value [i]  <> - 999 and input <100
    Input = input + 1
    If value [I]>= min and value [I] <=max
    THEN valid = valid + 1
            Sum = sum + value [I]
    ELSE
            SKIP
    END IF
     i = i + 1;
    END DO
    IF Valid > 0
    THEN avg = sum/valid
    ELSE
            Avg = -999
    END IF
    END AVERAGE
```

a)    Draw a flow graph for the above given algorithm.
b)    Determine the cyclomatic complexity by applying
      i)      Number of regions
      ii)     Edges and nodes
      iii)    Predicate nodes
c)    Determine a basis set of linearly independent paths.

**Assignment 4.**

Prepare the test cases corresponding to each independent path identified in Q3.

**Assignment 5.**

Draw a Graph Matrix corresponding to algorithm given in Q3 & compute the cyclomatic complexity. Prepare the test cases of the given algorithm to test the conditions using CONDITION TESTING.

**Assignment 6.**

Write a program in any programming language to accept a number and generate a table. Draw a flow graph and design various test cases for testing all possible paths.

**Assignment 7.**

Write a program in a programming language, specified by the examiner, to accept a 10 numbers & sort them in the order accepted at run time. Make a flow graph and design test cases for the condition testing. Also mention the expected results.

**Assignment 8.**

You are to prepare a Test Plan.  What are the various test factors to be analyzed that correspond to Project Risks?

**Assignment 9.**

A university's web site allows students to enroll online bio-data. The form contains following fields:

      i. Name of the student
     ii. Father's name
    iii. Address
    iv. City
     v. State
    vi. Pin code
   vii. Sex
  viii. Date of Birth
    ix. Academic Qualifications
          a. Exam Passed
          b. University/Board
          c. Marks obtained
          d. Division
          e. Max Marks

Design the validation checks for the given fields.

**Assignment 10.**

Assume there is functionality to log-in through the screen given below:

Write a set of black box test cases to test the functionality of the given screen.

**Assignment 11.**

Prepare a checklist to review the Requirements and Design

**Assignment 12.**

Write a program to find the sum of the matrices.  Write all the test cases so as to verify the correctness of the logic.

**Assignment 13.**

Write the code for binary and linear search. Find the cyclomatic complexity of the two by drawing the flow graph.

**Assignment 14.**

Prepare a list of checks to test date, numeric and alpha fields in any data entry screen.

**Assignment 15.**

Create du and dc graph for the following program:
```
    scanf(x,y);
            if (y < 0)
                    pow = pow – y;
            else
                    pow = y;

            z = 1.0;
    while(pow != 0)
    {
            z = z * x;
            pow = pow – 1;
    }
    if (y < 0)
            z = 1.0/z;
    printf(z);
```

**Assignment 16.**

Create the flow graph of the above Q15 and compute the cyclomatic complexity.

**Assignment 17.**

Prepare the list of test cases for q16

**Assignment 18.**

Write a program to compute the factorial of a number and create du and dc graph for the same.

**Assignment 19.**

Create the graph matrix of the Q18 and compute the cyclomatic complexity.

**Assignment 20.**

Prepare the list of test cases for q19

**Assignment 21.**

Write a program to create fibonacci series and and create du and dc graph for the same.

**Assignment 22.**

Create the flow graph of Q21 and compute the cyclomatic complexity.

**Assignment 23.**

Prepare the list of test cases for q22

**Assignment 24.**

Prepare a checklist to test the Graphical User Interface of Windows based application.

**Assignment 25.**

Prepare a comprehensive checklist to test a WEB Site