No. of Printed Pages : **8**

A6-R5.1 : COMPUTER ORGANIZATION AND OPERATING SYSTEM

DURATION : 03 Hours **MAXIMUM MARKS : 100**

OMR Sheet No. :						

Roll No. : | | | | | | |

Answer Sheet No. : | | | | | | |

Name of Candidate : _____ **; Signature of Candidate :** _____

INSTRUCTIONS FOR CANDIDATES :

- Carefully read the instructions given on Question Paper, OMR Sheet and Answer Sheet.
- Question Paper is in English language. Candidate has to answer in English language only.
- There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.
- **PART ONE** is Objective type and carries **40** Marks. **PART TWO** is Subjective type and carries **60** Marks.
- **PART ONE** is to be answered in the **OMR ANSWER SHEET** only, supplied with the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book for **PART TWO**.
- 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** to the Invigilator.
- **Candidate cannot leave the examination hall/room without signing on the attendance sheet and handing over his/her Answer Sheet to the invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.**
- After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question Booklet is complete in all respects.

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

PART - ONE

(Answer all the 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 "OMR" answer sheet supplied with the question paper, following the instructions therein. (1x10)

1.1 Which of the following statements about the Control Unit is correct ?

(A) The Control Unit is responsible for fetching data from the memory and performing arithmetic operations.

(B) The Control Unit manages the flow of data between the CPU, memory, and peripheral devices by decoding instructions.

(C) The Control Unit executes all arithmetic and logical operations in the CPU.

(D) The Control Unit stores data that will be used by the Arithmetic Logic Unit.

1.2 In a system with a shared Bus Structure, what could happen if multiple devices attempt to use the bus simultaneously without a control mechanism ?

(A) The devices will automatically synchronize and transfer data without any conflict.

(B) The bus will prioritize the fastest device, allowing it to complete its data transfer first.

(C) A bus collision or contention will occur, leading to data corruption or communication failure.

(D) The control unit will dynamically allocate separate buses for each device to avoid conflict.

1.3 In a cache memory system, which mapping technique provides the least complexity but may suffer from frequent conflicts ?

(A) Fully Associative Mapping

(B) Set Associative Mapping

(C) Random Mapping

(D) None of the options

1.4 Which command would you use in Linux to change the ownership of a file ?

(A) chmod

(B) chgrp

(C) chown

(D) unmask

1.5 Which of the following scheduling algorithms is **most suitable** for time-sharing systems where each process gets an equal share of CPU time ?

(A) First-Come-First-Served (FCFS)

(B) Shortest Job First (SJF)

(C) Priority Scheduling

(D) Round Robin (RR)

1.6 Which of the following methods is **most efficient** when simplifying Boolean expressions using logic gates ?

(A) De Morgan's Theorem

(B) NOR gates only

(C) Karnaugh Maps (K-maps)

(D) 2's complement method

1.7 Which of the following commands is used to **list all currently running processes** in a Linux system ?

(A) ls

(B) ps

(C) top

(D) None of the options

1.8 Which of the following best describes a **context switch** in a multitasking operating system ?

(A) A process is moved to the background, allowing another process to take over the CPU in the foreground without storing its state.

(B) The CPU temporarily pauses the current process, and a new process begins executing with shared resources.

(C) The operating system terminates the current process and replaces it with a higher-priority process.

(D) The CPU halts the current process, saves all of its register states, and loads the saved state of another process, allowing it to resume execution from where it was suspended.

1.9 In Linux, what is the difference between an **absolute pathname** and a **relative pathname** ?

(A) An absolute pathname starts from the current directory, while a relative pathname starts from the home directory.

(B) An absolute pathname requires root privileges, while a relative pathname does not.

(C) An absolute pathname can only be used in the/bin directory, while relative pathnames are used everywhere.

(D) An absolute pathname begins with/, while a relative pathname starts from the current working directory.

1.10 Which of the following commands would you use to modify the file permissions of a file to read and write for the owner, but only read for the group and others ?

(A) chmod 666

(B) chmod 755

(C) chmod 644

(D) chmod 744

2. Each statement below is either TRUE or FALSE. Choose the most appropriate one and enter in the "OMR" answer sheet supplied with the question paper, following the instructions therein. (1x10)

2.1 When simplifying Boolean expressions using Karnaugh Maps (K-maps), larger groups of 1s lead to simpler expressions.

2.2 A process in the waiting state is waiting for CPU time to continue execution.

2.3 In a priority interrupt system, if multiple devices generate interrupts simultaneously, the operating system will handle them in the order they were received, regardless of the devices' priority levels.

2.4 In Linux, the command "pwd" prints the user's current working directory's absolute path.

2.5 Virtual memory allows a system to use more memory than is physically available by swapping pages in and out of disk storage.

2.6 In Boolean algebra, the expression $A + A' = 1$ always holds, regardless of the value of A.

2.7 Direct Memory Access (DMA) allows data transfers between peripherals and memory without using any CPU cycles.

2.8 The "find" command in Linux can be used to search files based on their size, but not based on their access time.

2.9 Increasing the size of cache memory always improves the performance of a system because it allows more data to be stored closer to the CPU.

2.10 Multithreading allows a single process to be divided into subprocesses that can run concurrently, enabling better resource utilization and improved application performance.

3. Match words and phrases in column X with the closest related meaning/ word(s) /phrase(s) in column Y. Enter your selection in the "OMR" answer sheet supplied with the question paper, following the instructions therein. **(1x10)**

X		Y	
3.1	Duplicating data across multiple disks for redundancy	**A**	DMA
3.2	A method to check for errors in data transmission	**B**	Fork System Call
3.3	Critical failure in the operating system	**C**	Bootstrapping
3.4	A state where processes continue to change but do not make progress	**D**	Thread Safety
3.5	Ensures data integrity when multiple threads access shared resources	**E**	Deadlock
3.6	Creates a new process by duplicating an existing one	**F**	Parity Bit
3.7	A systematic representation of input-output relationships for digital circuits	**G**	Memory Leak
3.8	A method allowing peripherals to access memory without CPU intervention	**H**	Mirroring
3.9	A combination of RAID 1 and RAID 0, providing both redundancy and performance	**I**	RAID 5
3.10	The process of starting up a computer and loading the operating system	**J**	Kernel Panic
		K	Truth Table
		L	RAID 10
		M	Livelock

4. Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Choose the most appropriate option, enter your choice in the "OMR" answer sheet supplied with the question paper, following instructions therein. **(1x10)**

A.	Karnaugh Map	**B.**	Virtual	**C.**	Temporal locality	**D.**	Turing Test
E.	Cache coherence	**F.**	rm	**G.**	Interrupt Handling	**H.**	Pipelining
I.	fork()	**J.**	Sequential Logic	**K.**	Multiplexers	**L.**	simplification
M.	Grep						

4.1 In CPUs, _____ improves performance by executing multiple instructions simultaneously at different stages of the instruction cycle.

4.2 The _____ system call in Linux creates a new process by duplicating the parent process.

4.3 Page replacement algorithms, such as FIFO and LRU, are used in _____ memory systems to decide which page to swap out.

4.4 _____ ensures that all copies of a particular piece of data across multiple processors or cores are kept consistent.

4.5 In Linux, the command _____ is used to search for a specific pattern within a file.

4.6 _____ are used to select one input from multiple inputs and forward it to the output.

4.7 _____ is a mechanism that allows a CPU to respond to an event by suspending the current process and executing an ISR.

4.8 The _____ is used to determine whether a machine exhibits intelligent behaviour.

4.9 The Linux command _____ is used to delete files or directories.

4.10 _____ refers to the tendency of a program to access the same memory locations repeatedly within a short period.

PART - TWO

(Answer any FOUR questions)

5. (a) What is the benefit of using biased representation for the exponent portion of a floating-point number ?

(b) Compute -5×7 using Booth's algorithm. Show all the steps of the algorithm, including the initial setup, the iteration steps, and the final result.

(5+10)

6. (a) Compare and contrast hard links and symbolic (soft) links in Linux.

(b) Demonstrate the use of basic Linux commands to accomplish the following tasks:

- Create a directory named Project.
- Create a file named notes.txt within Project and add text to it.
- Copy notes.txt to a new file named backup_notes.txt.
- Move backup_notes.txt to the home directory.
- List the contents of the Project to verify the actions performed.

Provide the commands used for each task.

(8+7)

7. (a) Describe the pipes and its functionality in Linux. Provide an example that illustrates the use of pipes to filter and process data from a command.

(b) Explain the purpose of redirecting output in Linux. Provide an example command that redirects the output of a command to a file and describe what happens to the output.

(7+8)

8. (a) Explain the differences between Static RAM (SRAM) and Dynamic RAM (DRAM) in terms of structure, speed, and use cases. Which type of memory would you prefer for cache memory and why ?

(b) Explain the concept of virtual memory and how it enhances the performance of a computer system. What are page replacement algorithms, and why are they necessary ?

(8+7)

9. (a) Discuss the significance of logic gates in computer arithmetic operations. Describe the basic logic gates (AND, OR, NOT, NAND, NOR, XOR) and provide a simple truth table for each gate.

(b) Explain the concept of floating-point representation and its components. Discuss the potential issues that may arise due to floating-point arithmetic, particularly focusing on precision and rounding errors.

(8+7)

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SPACE FOR ROUGH WORK

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