No. of Printed Pages : 4

Sl. No.

C10-R4 : SOFTWARE SYSTEMS

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

Roll No. : | | | | | | |

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

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

INSTRUCTIONS FOR CANDIDATES :

- Carefully read the instructions given on Question Paper, Answer Sheet.
- Question Paper is in English language. Candidate has to answer in English Language only.
- **Question paper contains Seven questions. The Question No. 1 is compulsory. Attempt any FOUR Questions from Question No. 2 to 7.**
- **Parts of the same question should be answered together and in the same sequence.**
- **Questions are** to be answered in the **ANSWER SHEET** only, supplied with the Question Paper.
- **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.

1. (a) Why is software engineering essential in today's software development environment ? How does it help in managing large and complex software systems ?

(b) Differentiate between functional and non-functional requirements. Provide suitable examples of each.

(c) What is procedural design ? How is it different from object-oriented design ? Explain with an example.

(d) Explain how encapsulation and inheritance support Object Oriented design.

(e) Differentiate between sequence and collaboration diagrams. What is the significance of numbering messages in collaboration diagrams ?

(f) Define unit testing, integration testing, system testing, and acceptance testing.

(g) Describe the skills and competencies required to be an effective software architect. **(7x4)**

2. (a) What is software reusability ? How is it different from software re-engineering ? Describe the benefits of both practices.

(b) Discuss the conditions under which the Prototype model, Spiral model, and Incremental model are best suited.

(c) Justify the statement: "Software Engineering is a layered technology." Explain each layer briefly. **(6+6+6)**

3. (a) Describe the key activities involved in requirements engineering. Why is stakeholder involvement critical during this phase ?

(b) Describe the process of writing an algebraic specification. Give an example of specifying a simple data type like a stack.

(c) What is requirements traceability ? Why is it important in long-term software projects ?

(d) What is the purpose of walkthroughs and inspections in software reviews ? How are they different ? **(4+5+5+4)**

4. (a) Discuss the purpose of Control and Process Specification (CPS). How does it help in refining system behaviour ?

(b) What is the significance of Entity-Relationship (ER) diagrams in modeling system data ? Create a basic ER diagram for a student enrollment system.

(c) Discuss the principles of modularity in software design. How does modular design enhance maintainability and reusability ?

(d) Draw the Control Flow Graph for the following code, and calculate the Cyclomatic Complexity.

```
if (x > 0) {
  y = x + 1;
} else {
   y = x - 1;
}
printf("%d", y);
```

(5+5+4+4)

5. (a) What is an actor in a use case model? Explain with a diagram how use cases and actors interact.

(b) What is the difference between association, aggregation, and composition ?

(c) What is the difference between <<include>> and <<extend>> relationships in use case diagrams ? Give examples of when you would use <<extend>> vs <<include>> in a use case model.

(6+6+6)

6. (a) What are the basic elements of a class diagram ? Explain with an example.

(b) Give the component diagram of a basic client-server application.

(c) What is a test suite ? How is it different from a test case ? Explain the criteria for selecting test cases in a regression test suite.

(d) What is safety-critical software ? Give real-life examples. How is risk analysis performed in safety-critical software projects ?

(4+4+5+5)

7. (a) Explain the steps involved in Architecture Tradeoff Analysis Method (ATAM).

(b) How does reverse engineering help in architecture recovery ?

(c) How does communication differ between agents and objects ?

(d) Describe the role of autonomy, proactiveness, and social ability in agent design.

(4+4+4+6)

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SPACE FOR ROUGH WORK