

SOFTWARE ENGINEERING
(CSEN 3201)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) For an online video game, which model will be your best choice
 - (a) Classical Waterfall Model
 - (b) Spiral Mode
 - (c) Prototyping Model
 - (d) Agile
- (ii) In Agile methodology, what is the primary purpose of the daily Scrum meeting?
 - (a) Discuss project budget
 - (b) Write test cases
 - (c) Finalize project requirements
 - (d) Track progress and identify roadblocks
- (iii) From functional strength point of view the worst type of cohesion is
 - (a) Coincidental
 - (b) Functional
 - (c) Logical
 - (d) Sequential
- (iv) In Object-Oriented Analysis and Design (OOAD), which UML diagram represents the structural view of a system?
 - (a) Use Case Diagram
 - (b) Sequence Diagram
 - (c) Class Diagram
 - (d) Activity Diagram
- (v) If branch coverage has been achieved on a unit under test, which of the following coverage is implicitly implied?
 - (a) Path coverage
 - (b) Multiple condition coverage
 - (c) Statement coverage
 - (d) Data flow coverage.
- (vi) Which metric is used to measure the complexity of a program's control flow in White Box Testing?
 - (a) Traceability Matrix
 - (b) Equivalence Class Partitioning
 - (c) Cyclomatic Complexity
 - (d) Boundary Value Analysis
- (vii) What is the main purpose of the traceability matrix in software testing?
 - (a) To establish a relationship between test cases and requirements
 - (b) To identify code duplication
 - (c) To improve code performance
 - (d) To minimize software licensing issues

- (viii) Critical Path method is a part of
 (a) SDLC (b) Project Scheduling
 (c) SRS (d) Risk Management.
- (ix) Which of the following maintenance types focuses on modifying software to accommodate changes in the environment?
 (a) Corrective Maintenance (b) Adaptive Maintenance
 (c) Preventive maintenance (d) Perfective Maintenance.
- (x) In software maintenance cost estimation, which factor significantly impacts effort and cost?
 (a) Number of users (b) Marketing strategies
 (c) Software complexity (d) Number of software licenses sold.

Fill in the blanks with the correct word

- (xi) Spiral model can be the worst choice if the project _____.
- (xii) In a decision tree, each internal node represents a _____, and each leaf node represents an outcome.
- (xiii) _____ analysis helps predict future maintenance effort based on historical data.
- (xiv) _____ is a testing technique where internal logic and structure of the code are tested.
- (xv) A class diagram in UML provides a _____ view of the system.

Group - B

2. (a) Suppose you are to develop a system where your client is familiar with different technical aspects of a software development and is ready to collaborate with your team. The only constraint is the time. They want the product to get delivered as early as possible. Which SDLC model should be used to develop the system? Justify your answer with three reasons. [[CO1](Evaluate/HOCQ)]
- (b) Who are the different categories of users of the SRS document and what are their expectations from the SRS document? [[CO1](Understand/LOCQ)]
- (c) What are the limitations of DFD model? [[CO1](Understand/LOCQ)]
- (2 + 3) + 4 + 3 = 12**
3. (a) Write the demerits of waterfall model. In what circumstances would prototyping be the best approach in system development? [[CO1](Analyse/HOCQ)]
- (b) What do you mean by aggregation and generalization? Explain with a proper example. [[CO3](Understand/LOCQ)]
- (c) Explain, with the help of a suitable schematic diagram, an SDLC model that helps managing risks arising from unclear / unstable requirements; mention what each of the quadrants in this diagram signifies. [[CO2](Apply/IOCQ)]
- 4 + 3 + 5 = 12**

Group - C

4. (a) Identify at least three reasons in favor of why functional independence is the key factor for a good software design. [[CO2](Apply/IOCQ)]

- (b) With suitable example explain the differences between aggregation and composition. [[CO2](Apply/IOCQ)]
- (c) With an example show how “inheritance” is represented in a Class Diagram. [[CO2](Remember/LOCQ)]
- (d) Identify the actors and use cases for the problem statement stated below. The draw the use case diagram for the given problem:
 The CSE students and Faculty use the Library System. The Library contains books and journals. Books can be issued to both the Students and Faculty. Journals can only be issued to the Faculty. The Librarian can only issue books and Journals. The deputy-Librarian is In-charge of receiving the Returned Books and Journals. Each student is provided with three Library cards for using the facilities of the Library. Students can be issued only three books on their available cards at a time. On the issue of the books the Librarian specifies a date on which the students are expected to return the book. In case they are unable to do so, they will be charged with a fine of Rs 2 per day. The Accountant is responsible for receiving the fine for over-due books. Each Faculty is provided with a Library member ID. Faculties can be issued a maximum of five books at a time. The issue of Journals and Books to the Faculties is also performed in the same manner. Faculties are not charged with any fine. [[CO2](Design/HOCQ)]
- 3 + 2 + 1 + 6 = 12**

5. (a) Draw a Class diagram for online job portal in which job seeker log in the system, then they can view the current job (by location, by job nature, by qualification). After that they can apply for a suitable job. System must send an acknowledgement after being successfully applied. Different employer also can log in the system and then they can request to admin to post different new jobs. Admin has the right to add/delete job, change job details etc. You should include different class (with attribute and functionality), relationship between classes, multiplicity, generalization etc. [[CO3](Create/HOCQ)]
- (b) “Loosely coupled and strongly cohesive system is our target”-explain. [[CO2](Analyze/IOCQ)]
- (c) What do you mean by temporal cohesion? Give example. [[CO2](Remember/LOCQ)]
- 6 + 4 + 2 = 12**

Group – D

6. (a) Explain with an example when Corrective, Adaptive, and Perfective Maintenance should be applied. [[CO4](Apply/IOCQ)]
- (b) Suppose a company’s software is facing performance issues after OS updates. Which type of maintenance should be performed? Justify your answer. [[CO4](Apply/IOCQ)]
- (c) A large bank is launching an online banking system. The software must be highly secure, scalable, and reliable. Explain which testing strategy (Black Box or White Box) would be more appropriate for security testing and why. [[CO3](Analyze/HOCQ)]
- (2 + 2 + 2) + 3 + 3 = 12**
7. (a) When ‘Stub’ is used for Unit Testing of modules. [[CO3](Remember/LOCQ)]

- (b) Design a White Box Test suite for the following code: (Construct the control flow graph and determine the basis set of linearly independent paths). *[[CO3](Create/HOCQ)]*

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

```
int main()
```

```
{
```

```
    int n1, n2, i, gcd;
```

```
    printf("Enter two integers: ");
```

```
    scanf("%d %d", &n1, &n2);
```

```
    for(i=1; i <= n1 && i <= n2; ++i)
```

```
    {
```

```
        // Checks if i is factor of both integers
```

```
        if(n1%i==0 && n2%i==0)
```

```
            gcd = i;
```

```
    }
```

```
    printf("G.C.D of %d and %d is %d", n1, n2, gcd);
```

```
    return 0;
```

```
}
```

- (c) What is regression testing?

[[CO3](Remember/LOCQ)]

$$2 + (3 + 2 + 3) + 2 = 12$$

Group - E

8. (a) Assume that the size of an semi detached type software product has been estimated to be 100000 lines of source code. Assume that the average salary of software engineers is Rs. 50000/- per month. Determine the effort required to develop the software product and nominal development time. *[[CO5](Analyse/IOCQ)]*
- (b) What do you mean by Slack time? *[[CO6](Understand/LOCQ)]*
- (c) Differentiate between Gantt chart and PERT chart. *[[CO6](Analyse/IOCQ)]*

$$5 + 3 + 4 = 12$$

9. A software company is developing a new customer relationship management (CRM) system. The project consists of the following activities:

Activity	Description	Predecessor(s)	Duration (Days)
A	Requirements Analysis	-	5
B	Design Database Schema	A	7
C	Develop Backend API	B	10
D	Develop Frontend UI	A	8
E	Integration Testing	C, D	6
F	Deployment	E	4

- (i) Draw the project activity network diagram. *[[CO6](Create/IOCQ)]*
- (ii) Identify the critical path and calculate the project duration. *[[CO6](Analyse/LOCQ)]*
- (iii) If the duration of Activity C is delayed by 3 days, how does it affect the project schedule? *[[CO26](Apply/IOCQ)]*

$$4 + 4 + 4 = 12$$

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	25	41.67	33.33