

**SOFTWARE ENGINEERING
(CSEN 6101)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

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

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Which of the following is the most important feature of Spiral Model?
(a) Quality Management (b) Maintenance
(c) Risk Assessment (d) None of these.
 - (ii) Tracking the correspondence between the design component and the SRS is known as
(a) availability (b) traceability
(c) maintainability (d) reliability.
 - (iii) What should we re-estimate after finalization of the SRS?
(a) Software Size (b) Development Cost
(c) Development Time (d) All of these.
 - (iv) To achieve a good software design, modules should have
(a) Weak Cohesion and Low Coupling
(b) Weak Cohesion and High Coupling
(c) Strong Cohesion and Low Coupling
(d) Strong Cohesion and High Coupling.
 - (v) Which of the following is a property of a good use case?
(a) Starts with a request from the system to an actor.
(b) Ends with the system producing all answers the actor asked for.
(c) Describes the internal activities the system must take to produce all the answers the actor asked for
(d) None of the above.

- (vi) Modularity
(a) is a feature of all programming languages
(b) helps to make large programs more understandable
(c) both (a) and (b)
(d) none of these.
- (vii) Use of recursion
(a) enhances logical clarity and reduces code size
(b) makes debugging easier
(c) reduces execution time
(d) makes software bug-free.
- (viii) Alpha-testing is done by
(a) the development team (b) a friendly set of customers
(c) the customer himself (d) none of these.
- (ix) Cardinality in an ER Diagram refers to
(a) number of attributes in an entity
(b) the order of co-related entities
(c) the number of sub-entities
(d) degree of a relationship.
- (x) Which of the following statements is False?
(a) UML class diagrams are a good way to represent the algorithmic nature of the interactions between classes
(b) Maintenance is one of the stages of software development.
(c) Design and architecture are often referred to as the “what” of the system and requirements as the “how”
(d) The number of modules in a system is one way to measure complexity of that system.

Group - B

2. (a) What are CASE tools? How are they helpful in software development life cycle?
(b) What are the most important characteristics of a requirements specification? Explain why each of them is so important. **6 + 6 = 12**
3. (a) Why and/or when is it necessary to develop a prototype during software development? Explain in brief with suitable example(s).

- (b) Draw a schematic for a typical spiral model for software development lifecycle. What does each of the four quadrants in this model signify? Explain in brief.
- (c) Name any three non-functional requirements that you consider important for some web-based online e-shopping software system to be used by consumers.

4 + 5 + 3 = 12

Group - C

4. (a) What are the different items developed during the software design phase? Provide suitable example(s).
- (b) What are the main characteristics of a good software design? Explain in brief.
- (c) List the different types of views of a system captured by UML diagrams.

5 + 4 + 3 = 12

5. The main function of a vending machine is to allow a customer to buy product(s) from the machine (candy, chocolate, soda, juice, etc.). When the customer wants to buy some of the products offered by the vending machine, he/she inserts money into the machine, selects one or more products, and the machine dispenses the selected product(s) to the customer. Should the products cost less than the amount of money the customer put in the machine, the vending machine shall dispense change. Also, the vending machine needs to be restocked when it runs out of certain products. In addition, there must be a provision for a person (say, a collector) to collect money from the vending machine.
- (i) Identify the potential actors for such a vending system and draw a use-case diagram that clearly depicts the actors, the system boundary, and the use-cases with which the actors interact.
- (ii) Define two possible scenarios for two of your use cases. Capture the typical scenarios; do not worry about abnormal cases at this point.
- (iii) Mention two of exception-cases that we might need to handle in the vending machine system.

(4 + 4 + 4) = 12

Group - D

6. (a) Differentiate between the following – use suitable example(s):
 (i) External Documentation and Internal Documentation
 (ii) Verification and Validation
 (iii) Functional Testing and Structural Testing.
- (b) Define and mention usefulness of the following – use suitable example(s):
 (i) Cyclomatic Complexity
 (ii) Regression Testing.

(3 × 2) + (2 × 3) = 12

7. You are given a program that accepts 3 numbers as input (length of sides of triangle). The program output is taken from the set {Equilateral, Isosceles, Scalene, Invalid}. The program is supposed to choose the most specific descriptor. (i.e 2, 2, 2 should return Equilateral and 2, 2, 1 should return Isosceles.) You do not have the source code for this program.
- (i) Is this a white box or black box testing? Explain.
- (ii) Name at least one advantage and one disadvantage of each approach.
- (iii) Why are both approaches necessary?

(3 + 4 + 5) = 12

Group - E

8. (a) Explain, using suitable example(s): Work Breakdown Structure, Gantt Chart, and PERT Chart.
- (b) Explain, using suitable example(s): Risk Identification, Estimation and Mitigation.

6 + 6 = 12

9. (a) Work out the LOC value that seems to be the most accurate. A company needs to develop a strategy for software product development for which it has a choice of two programming languages L1 and L2. The number of lines of code (LOC) developed using L2 is estimated to be twice the LOC developed with L1. The product will have to be maintained for five years. Various parameters for the company are given in the table below.

Parameter	Language L1	Language L2
Man years needed for development	LOC / 10000	LOC / 10000
Development Cost per year	Rs.10,00,000	Rs.7,50,000
Maintenance time	5 years	5 years
Cost of maintenance per year	Rs.1,00,000	Rs.50,000

Total cost of the project includes cost of development and maintenance. What is the LOC for L1 for which the cost of the project using L1 is equal to the cost of the project using L2?

(A) 4000 (B) 5000 (C) 4333 (D) 4667

- (b) Work out the estimated effort that seems to be the most appropriate. A company needs to develop digital signal processing software for one of its newest inventions. The software is expected to have 40000 lines of code. The company needs to determine the effort in person-months needed to develop this software using the basic COCOMO model. The multiplicative factor for this model is given as 2.8 for the software development on embedded systems, while the exponentiation factor is given as 1.20. What is the estimated effort in person-months?

(A) 234.25 (B) 932.50 (C) 287.80 (D) 122.40

6 + 6 = 12