

**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) “If data-items EMP-DOB, EMP-SEX and TOT-EARN from module CALC-EARN are passed on to module CALC-ITAX, then these two modules are said to have ____ coupling.” – fill in the blank with the correct choice.
(a) stamp (b) data (c) control (d) common.
 - (ii) From functional strength point of view the best type of cohesion is
(a) coincidental (b) logical
(c) functional (d) sequential
 - (iii) Which is the most important feature of spiral model?
(a) Quality management (b) Risk management
(c) Performance management (d) Efficiency management.
 - (iv) A module is said to have logical cohesion, if
(a) it performs a set of tasks that relate to each other very loosely.
(b) all the functions of the module are executed within the same time span.
(c) all elements of the module perform similar operations, e.g., error handling, data input, data output etc.
(d) none of the above.
 - (v) High coupling among modules makes it
(a) difficult to understand and maintain the product
(b) difficult to implement and debug
(c) expensive to develop the product as the modules having high coupling cannot be developed independently
(d) all of the above

- (vi) Equivalence class partitioning is followed in the
 - (a) White box testing
 - (b) Black box testing
 - (c) Verification
 - (d) None of these.
- (vii) The deviation of the observed behaviour to the specified is called:
 - (a) Error
 - (b) Fault
 - (c) Failure
 - (d) Defect.
- (viii) Black-box testing attempts to find errors in which of the following categories?
 - (a) Incorrect or missing functions
 - (b) Interface errors
 - (c) Performance errors
 - (d) All the above.
- (ix) As a software manager, when you will decide the number of people required for a software project?
 - (a) Before the scope is determined.
 - (b) Before an estimate of the development effort is made.
 - (c) After an estimate of the development effort is made.
 - (d) None of the above.
- (x) When user requirements are not complete and/or technical issues are not clear which model should be followed for software development?
 - (a) Spiral Model
 - (b) Waterfall Model
 - (c) Prototyping Model
 - (d) RAD Model.

Group - B

- 2. (a) Explain for which type of software development spiral model is suitable?
- (b) What are the activities carried out during the structured analysis phase?
- (c) What are the commonly made errors while constructing a DFD model?
- (d) What are the shortcomings of a DFD model?

3 + 3 + 3 + 3 = 12

- 3. (a) What do you mean by requirement validation and why it is required?
- (b) Why is the SRS document also known as the black box specification of a system? Explain.
- (c) Suppose the analyst of a large product development effort has prepared the SRS document in the form of a narrative essay of the system to be developed. Based on this document, the product development gets underway. Explain the problems that such a requirements specification document may create during development.

Group - E

- 8. (a) Suppose you are developing a software product in the organic mode. You have estimated the size of the product to be about 100,000 lines of code. Compute the nominal effort and the development time.
- (b) The following table indicates the various tasks involved in completing a software project, the corresponding activities, and the estimated effort for each task in person-months.

<i>Notation</i>	<i>Activity</i>	<i>Effort in person-months</i>
T ₁	Requirements Specification	1
T ₂	Design	2
T ₃	Code actuator interface module	2
T ₄	Code sensor interface module	5
T ₅	Code user interface part	3
T ₆	Code control processing part	1
T ₇	Integrate and Test	6
T ₈	Write user manual	3

The precedence relation $T_i \leq \{T_j, T_k\}$ implies that the task T_i must complete before either task T_j or T_k can start. The following precedence relation is known to hold among different tasks: $T_1 \leq T_2 \leq \{T_3, T_4, T_5, T_6\} \leq T_7$.

- (i) Draw the Activity Network representation of the project.
- (ii) Draw the Gantt chart representation of the project.
- (iii) Which tasks are on the critical path?

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

- 9. (a) As the manager of a software project to develop a product for business application, if you estimate the effort required for completion of the project to be 50 person-months, can you complete the project by employing 50 developers for a period of one month? Justify your answer.
- (b) Is it true that a software product can always be developed faster by having a larger development team (you can assume that all developers are equally proficient and have exactly similar experience)? Justify your answer.
- (c) What is the difference between a revision and a version? What do you understand by the terms change control and version control? Why are these necessary? Explain how change and version control are achieved using a configuration management tool.

2 + 2 + (2 + 2 + 2 + 2) = 12

- (d) Consider a student admission system for XYZ University, which is to be automated. For this system: a) make level-0, 1 and 2 DFDs of the said student admission system; b) draw an ER diagram of the said system.

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

Group - C

4. (a) Explain the relationship between the definition of module interfaces and the design principle of 'information hiding'.
- (b) Do you agree with the following assertion? "A design solution that is difficult to understand would lead to increased development and maintenance cost." Give reasoning's for your answer.
- (c) What do you mean by the terms cohesion and coupling in the context of software design? How are these concepts useful in arriving at a good design of a system?
- (d) Is it true that whenever you increase the cohesion of your design, coupling in the design would automatically decrease? Justify your answer by using suitable examples.

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

5. (a) What do you understand by the term functional independence in the context of software design? What are the advantages of functional independence? How can functional independence in a software design be achieved?
- (b) What do you understand by information hiding in the context of software design? Explain why a design approach based on the information hiding principle is likely to lead to a reusable and maintainable design. Illustrate your answer with a suitable example.
- (c) Do you agree with the assertion: "The essence of any good function-oriented design principle is to map similar functions into a module". Give reasons behind your answers.

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

Group - D

6. (a) Draw the control flow graph (CFG) for the following function and from the CFG, determine the cyclomatic complexity:

```
int compute_gcd (int x, int y) {
1. while (x != y) {
2.   if (x > y) then
3.     x = x - y;
4.   else y = y - x;
5. }
6. return x;
}
```

- (b) Design a test suite for the above *compute_gcd* function using the following white-box testing strategies:
- Statement coverage
 - Branch coverage
 - Condition coverage
 - Path coverage.

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

7. (a) Identify the types of defects that you would be able to detect during the following:

- Code inspection
- Code walkthrough

- (b) Draw the control flow graph (CFG) for the following function named *find-maximum*. From the CFG, determine its cyclomatic complexity.

```
int find-maximum (int i, int j, int k)
{
  int max;
  if (i > j) then
    if (i > k) then
      max=i;
    else
      max=k;
  else if (j>k) then
    max=j;
  else
    max=k;
  return(max);
}
```

- (c) Distinguish between alpha, beta and acceptance testing. How are the test cases designed for these tests?

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