

B.TECH/CSE/6<sup>TH</sup> SEM/CSEN 3202/2018  
**SOFTWARE ENGINEERING**  
**(CSEN 3202)**

**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) "An SRS usually contains the following: User Characteristics, Module Structure, Functional Requirements, External Interface Requirements, and Non-Functional Requirements." – choose the odd one.  
(a) Module Structure  
(b) User Characteristics  
(c) Non-Functional Requirements  
(d) External Interface Requirements.
- (ii) Which diagram should depict the entire system as one single bubble?  
(a) Sequence Diagram (b) E-R Diagram  
(c) Context Diagram (d) Activity Diagram.
- (iii) Which type of cohesion is considered to be the lowest?  
(a) Coincidental (b) Logical  
(c) Functional (d) Sequential.
- (iv) Which type of coupling is considered to be the lowest?  
(a) Stamp (b) Data (c) Control (d) Common.
- (v) What does COCOMO acronym stand for?  
(a) Collective Cost Estimation Model  
(b) Complete Cost Estimation Model.  
(c) Constructive Cost Estimation Model  
(d) Common Cost Estimation Model.

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- (vi) Which of the following is the most important feature of spiral model?  
(a) Quality Management (b) Maintenance  
(c) Risk Assessment (d) None of these.
- (vii) The desirable characteristics that every good software design needs are  
(a) correctness (b) understandability  
(c) efficiency (d) all of the above.
- (viii) The deviation of the observed behaviour to the specified is called  
(a) error (b) fault (c) failure (d) defect.
- (ix) 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.
- (x) As a software manager, when will you 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.

**Group - B**

2. Answer the following questions in the context of Software Development Life Cycle (SDLC) Models:
- (a) What is a prototype, and under what circumstances is it beneficial to construct a prototype? Explain, in brief, using one suitable example.
- (b) 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.
- (c) Imagine that you have been made the Project Manager for a custom-made software application development project that is about to commence. What are the major factors you will consider before choosing a suitable SDLC model to be used for this project? Discuss in brief.

**3 + 5 + 4 = 12**

3. Answer the following questions in the context of Software Requirements Specification (SRS):

- What are the different categories of users of the SRS document and what are their respective expectations from that? Discuss in brief.
- Provide *one* suitable example of using the Decision Table technique to represent complex processing logic in a structured manner.
- Provide examples of *any two* important non-functional requirements for an internet-based banking system which will allow bona fide account holders to make online transaction for payment through bank transfer within a maximum of 180 seconds any time of the day, either from a desktop / laptop or from a mobile.

**3 + 5 + 4 = 12**

### Group - C

- Explain the relationship between the definition of module interfaces and the design principle of 'information hiding'.
- Do you agree with the following assertion? "A design solution that is difficult to understand would lead to increased development and maintenance cost." Give reasons for your answer.
- 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?
- 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. Answer the following questions in the context of Unified Modeling Language (UML):

- Provide suitable examples to explain Generalization, Composition, and Aggregation.
- Draw a Class Diagram (methods / operations *not* needed) for the Materials Management System (MMS) for M/s Caddie-Luck, a famous automobile manufacturer. Make necessary assumptions and state those clearly. The following are the details as gathered from Mr. Choop Chap, the materials manager of Caddie-Luck, during the Requirement Analysis stage.

- Supplier – identified by Supplier Id; has Supplier Name, City, and PIN; can supply one or more Part;
- Part – identified by Part Id; has Part Name, and Price; can be supplied by one or more Supplier;
- Supply – identified by Supplier Id, Part Id, and Supply Date; has Supply Quantity; can contain only one Part;
- Invoice – identified by Invoice No., and Invoice Date; has Invoice Amount; can refer to only one Supply [since partial Invoice against a Supply is not allowed];
- Payment – identified by Payment No., and Payment Date; has Payment Amount, and Cheque No.; can refer to one or more Invoice [since partial Payment against an Invoice is allowed];

**6 + 6 = 12**

### Group - D

6. Answer the following questions in the context of Software Testing:

- What is the difference between Validation and Verification? Explain with suitable examples in terms of SDLC stages.
- Differentiate between Code Walk-Through and Code Inspection with suitable examples.
- A program named QES (Quadratic Equation Solver) is developed to find the roots of a quadratic equation:  $ax^2 + bx + c = 0$ , where a, b, c are assumed to be user inputs, and each of these are considered as single-digit integers ranging between -9 to +9, including 0.
  - Design the Equivalence Classes of Test Cases for testing QES.
  - Identify the Test Cases for Boundary Value Analysis for QES.

**2 + 2 + 8 = 12**

7. Answer the following questions in the context of Software Testing:

- Discuss, with suitable examples, why we need both Black Box Testing (BBT) and White Box Testing.
- Briefly explain the role of Stub and Driver for Unit Testing of modules.
- Consider the following piece of code (including line numbers) corresponding to Bubble Sort of arr, a one-dimensional array of integers with n number of elements.

```

01  int n, arr[100], tmp;
02  /* n is assumed to be between 1 and 100 */
03:  /* arr is assumed to be arbitrarily populated with integer values */
04:  /* tmp is used for swapping two values */
05:  for (int i=0; i<n; i++)
06:  {
07:      for (int j=0; j<n-1; j++)
08:      {
09:          if (arr[j]>arr[j+1])
10:          {
11:              tmp = arr[j+ 1];
12:              arr[j+ 1] = arr[j];
13:              arr[j] = tmp;
14:          }
15:      }
16:  }

```

- i) Construct a Control Flow Graph (CFG) corresponding to the above code.
- ii) Identify the linearly independent program paths.
- iii) Find the Cyclomatic Complexity.

$$2 + 2 + 8 = 12$$

### Group -E

8. Answer the following questions in the context of Software Estimation:

- (a) Mention the categorization of software development projects, made by Barry Boehm [1981], with suitable example(s) for each category.
- (b) What are the two main parameters that are estimated using COCOMO Model, and what are their respective units of measure? Name any one parameter / factor, other than these two, that can have significant impact on total project cost.
- (c) It has been estimated that some business application software will be of 1000 Function Points (FP). The nominal productivity has been assumed to be 10 Person-Hour (PH) per FP. If each experienced team member works 40-hour weeks, and is allowed two weeks of vacation in a year, work out the expected average team size to complete the development (from Requirements up to System Testing) in one calendar year. Then suggest one team loading chart (team size versus time) given the fact that you have to use variable team size during different stages of the SDLC.

[Note: (i) Partial / Fractional allocation of team members is NOT allowed, and (ii) All team members have to be allocated for AT LEAST TWO CONSECUTIVE months.]

$$3 + 3 + 6 = 12$$

9. Answer the following questions in the context of Software Maintenance:

- (a) What are the different types of maintenance that a software application / product / system might need? Explain, in brief, with suitable example(s).
- (b) Mention any three factors on which software maintenance activities depend.

List the typical activities needed to fix some defects in a Payroll system that sometimes generates incorrect Gross Pay values in Monthly Pay-slips for employees having Overtime Hours during that month.

$$6 + 3 + 3 = 12$$