

SOFTWARE ENGINEERING
(INFO 2201)

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) Software is defined as _____
 - (a) set of programs, documentation and configuration of data
 - (b) set of programs
 - (c) documentation and configuration of data
 - (d) none of the mentioned.
 - (ii) _____ is defined as the process of generating analysis and designing documents?
 - (a) Re-engineering
 - (b) Reverse engineering
 - (c) Software re-engineering
 - (d) Science and engineering
 - (iii) _____ is a software development life cycle model that is chosen if the development team has less experience on similar projects.
 - (a) Iterative Enhancement Model
 - (b) RAD
 - (c) Spiral
 - (d) Waterfall
 - (iv) If every requirement can be checked by a cost-effective process, then the SRS is _____
 - (a) Verifiable
 - (b) Traceable
 - (c) Modifiable
 - (d) Complete.
 - (v) Which plan describes how the skills and experience of the project team members will be developed?
 - (a) HR Plan
 - (b) Manager Plan
 - (c) Team Plan
 - (d) Staff Development Plan.
 - (vi) Effective software project management focuses on the four P's. What are those four P's?
 - (a) People, performance, payment, product
 - (b) People, product, process, project
 - (c) People, product, performance, project
 - (d) All of the above.

- (vii) Aggregation represents ____
(a) *is_a* relationship (b) *part_of* relationship
(c) *composed_of* relationship (d) none of above.
- (viii) The project planner examines the statement of scope and extracts all-important software function, which is known as
(a) Planning process (b) Decomposition
(c) Association (d) All of the mentioned
- (ix) The agile software development model is built based on ____
(a) Linear Development
(b) Incremental Development
(c) Iterative Development
(d) Both Incremental and Iterative Development.
- (x) Clean Room Testing includes
(a) Code inspection (b) Code walkthrough
(c) Formal Verification (d) All the above.

Group- B

2. (a) Explain the prototyping model with diagram. [[CO1](Understand/LOCQ)]
(b) Evaluate the effectiveness of Lifecycle model in helping organizations manage projects successfully? [[CO1](Evaluate/HOCQ)]
6 + 6 = 12
3. (a) Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):
• the NHL has many teams
• each team has a name, a city, a coach, a captain, and a set of players
• each player belongs to only one team
• each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records
• a team captain is also a player
• a game is played between two teams (referred to as *host_team* and *guest_team*) and has a date (such as May 11th, 2017) and a score (such as 4 to 2)
Construct a clean and concise ER diagram for the NHL database using the Chen notation as in your textbook. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your ER diagram. [[CO2](Create/HOCQ)]
(b) Explain the characteristics of a good SRS document. [[CO2](Understand/LOCQ)]
8 + 4 = 12

Group - C

4. (a) Describe various coupling and cohesion methods used in software design. [[CO3](Understand/LOCQ)]

- (b) Compare Activity and state chart diagram. Mention the elements of an Activity Diagram. [[CO3](Analyze/IOCQ)]
6 + 6 = 12
5. (a) Evaluate the effectiveness of an Object Oriented Analysis and Design approach for a complex software system in terms of its scalability, maintainability and flexibility. [[CO3](Evaluate/HOCQ)]
- (b) What are the different types of diagrams available to depict different views of a system? [[CO3](Remember/LOCQ)]
6 + 6 = 12

Group – D

6. (a) “*Driver* and *stub* modules are required in the context of integration and unit testing of a software” – Justify with example. [[CO4](Evaluate/HOCQ)]
- (b) Define a metric from which the upper bound for the number of linearly independent paths of a program can be computed. How that metric is calculated? [[CO4](Remember/LOCQ)]
- (c) What do you mean by regression testing? When is regression testing carried out? [[CO4](Remember/LOCQ)]
6 + (1 + 3) + (1 + 1) = 12
7. (a) Suppose a C program has 240 sequence type of statements, 50 selection type of statements and 40 iteration type of statements, determine the minimum number of test cases required for path testing. [[CO4] (Evaluate/HOCQ)]
- (b) Consider the following C function named *bin-search*:
- ```
/* num is the number the function searches in a presorted integer array arr */
int bin_search(int num){
 int min, max;
 min = 0;
 max = 100;

 while (min!=max){
 if (arr[(min+max)/2]>num)
 max = (min+max)/2;
 else if (arr[(min+max)/2]<num)
 min=(min+max)/2;
 else return((min+max)/2);
 } return (-1);
}
```
- Design a test suite for the function *bin-search* that satisfies the following white-box testing strategies (Show the intermediate steps in deriving the test cases):
- (i) Statement coverage
  - (ii) Branch coverage
  - (iii) Condition coverage. [[CO4](Create/HOCQ)]  
**6 + (2 + 2 + 2) = 12**

**Group - E**

8. (a) Briefly discuss COCOMO estimation model and the basic differences between COCOMO and COCOMO II model? [[CO5](Analyze/IOCQ)]  
 (b) Calculate the FPA if all complexity adjustment factors and weight adjustment factors are average (i.e. 4, 5, 4, 7, 10 respectively) for the following values: Input=10, Output=30, Enquiry=50, Interface=10 and User File=20. [[CO5](Analyze/IOCQ)]  
**6 + 6 = 12**
9. (a) Given the following values, calculate the FP when the complexity adjustment factors are significantly complex product and weighting factors are high (i.e. 6,7,6,15,10 respectively).  
 User input =55, User Output =35, User Enquiries =40, User Files =8, External Interfaces =5. [[CO5](Apply/IOCQ)]  
 (b) Describe with an example how the effect of risk on project schedule is evaluated using PERT. [[CO6](Evaluate/HOCQ)]  
**6 + 6 = 12**
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| <i>Cognition Level</i>         | <i>LOCQ</i>  | <i>IOCQ</i> | <i>HOCQ</i>  |
|--------------------------------|--------------|-------------|--------------|
| <i>Percentage distribution</i> | <i>29.17</i> | <i>25</i>   | <i>45.83</i> |

**Course Outcome (CO):**

After the completion of the course students will be able to

1. Understand the basic concept of SDLC stages and different SDLC models.
2. Model function-oriented software design.
3. Develop object-oriented software design.
4. Analyze different approaches of testing methodology in software system.
5. Estimate size, effort, cost and time related to a software project.
6. Work out software project schedule and staffing plan.

*\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*