

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT  
(INFO 3103)

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) When the two bubbles are interconnected directly, it is referred as  
(a) Synchronous DFD (b) Direct DFD  
(c) Serial DFD (d) Balanced DFD.
  - (ii) Which one of the following is the MOST desirable type of cohesion?  
(a) Coincidental Cohesion (b) Temporal Cohesion  
(c) Functional Cohesion (d) Procedural Cohesion.
  - (iii) Function Point describes  
(a) the SRS document  
(b) the test plans  
(c) the functional decomposition  
(d) the size of a software product directly from its specification.
  - (iv) When a system interfaces with other types of systems then the testing that required will be  
(a) Volume Testing (b) Compatibility Testing  
(c) Maintenance Testing (d) Configuration Testing.
  - (v) MTBF is measured in terms of  
(a) day (b) year (c) hours (d) minutes.
  - (vi) The type of failure that occurs for all input values while invoking a function of the system is  
(a) Transient Failure (b) Permanent Failure  
(c) Recoverable Failure (d) Unrecoverable Failure.

- (vii) The chain of activities that determines the duration of the project  
(a) Critical Path (b) Duration Path  
(c) Linear Independent Path (d) None of these
- (viii) Swim lane is defined in  
(a) State Chart Diagram (b) Activity Diagram  
(c) Use Case Diagram (d) Sequence Diagram.
- (ix) To allocate resource to activities we use  
(a) Gantt Chart (b) PERT chart  
(c) Network Diagram (d) Activity Network.
- (x) Big Bang Integration testing is useful for projects with  
(a) smaller number of modules (b) large number of modules  
(c) average number of modules (d) none of these.

**Group - B**

2. (a) List out all the phases of SDLC. Write down the disadvantages of waterfall model. What is data dictionary? Write down the importance of using it in the context of good software design.
- (b) Explain the situation where a prototype of the actual product is preferred.
- Consider Library Membership Automation Software (LMS) where it should support the following three options:  
New member  
Renewal  
Cancel membership
- When the 'new member' option is selected, the software asks details about the member like the member's name, address, phone number etc. If proper information is entered then a membership record for the member is created.
- If the 'renewal' option is chosen, the LMS asks for the member's name and his membership number to check whether he is a valid member or not. If the membership is valid then membership expiry date is updated and the annual membership bill is printed, otherwise an error message is displayed.
- If the 'cancel membership' option is selected, then the software asks for member's name and his membership number. The membership is cancelled, a cheque for the balance amount due to the member is printed and finally the membership record is deleted from the database.

Make the decision tree representation and the decision table representation of the above examples.

$$(2 + 2 + 1 + 1) + (2 + 4) = 12$$

3. (a) Write down at least three differences between function-oriented and object-oriented design approach. When a module is said to be functionally independent of other module?

(b) Draw a DFD (Upto 2<sup>nd</sup> level) for a Library Management System that includes the features like:

- Keep record of different categories like; Books, Journals, Newspapers, Magazines, etc.
- Classify the books subject wise.
- Easy way to enter new books.
- Keep record of complete information of a book like; Book name, Author name, Publisher's name, Date/ Year of publication, Cost of the book, Book purchasing date/ Bill no.
- Easy way to make a check-in/check-out.
- Automatic fine calculation for late returns.
- Different criteria for searching a book.
- Different kind of reports like; total no. of books, no. of issued books, no. of journals, etc.
- Easy way to know how many books are issued to a particular student.
- Event calendar for librarian to remember their dates.
- My Notes section for librarian to write any note.

Online access for registered user to see the status of their books.

$$(3 + 1) + (2 + 3 + 3) = 12$$

### Group - C

4. (a) Define testing. State the principles of testing.

(b) What are the attributes of good test? Discuss the characteristics of testable software.

$$(1 + 3) + (2 + 6) = 12$$

5. (a) Differentiate between White box testing and Black box testing. Discuss the different types of failure in a software product.

```
(b)  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);
      }
```

Draw the control flow graph for the above function and determine its cyclomatic complexity.

$$(4 + 3) + (3 + 2) = 12$$

### Group - D

6. (a) You have been appointed a software project manager for a company that services the genetic engineering world. Your job is to manage the development of a new software product that will accelerate the pace of gene typing. The work is R&D oriented, but the goal is to produce a product within the next year. What team structure would you choose and why? What software process model(s) would you choose and why?

Team A found 342 errors during the software engineering process prior to release. Team B found 184 errors. What additional measures would have to be made for projects A and B to determine which of the teams eliminated errors more efficiently? What metrics would you propose to help in making the determination? What historical data might be useful?

Is it possible for spoilage to increase while at the same time defects/KLOC decrease? Explain.

(b) Compute the count total value for a project with the following information domain characteristics:

Number of user inputs : 32 (weight factors : Low - 3, Average - 4, High - 6)  
 Number of user outputs: 60 (weight factors : Low - 4, Average - 5, High - 7)  
 Number of user inquiries: 24 (weight factors : Low - 3, Average - 4, High - 6)  
 Number of files: 8 (weight factors : Low - 7, Average - 10, High - 15)  
 Number of external interfaces: 2 (weight factors : Low - 5, Average - 7, High - 10)

Assume that all complexity adjustment values for inputs, outputs and files are average. Weight factors for inquiries and external interfaces are high.

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

7. (a) Assume you are a software project manager and that you have been asked to compute earned value statistics for a small software project. The project has 56 planned work tasks that are estimated to require 582 person-days to complete. At the time that you've been asked to do the earned value analysis, 12 tasks have been completed. However the project schedule indicates that 15 tasks should have been completed. The following scheduling data (in person-days) are available:

Task	Planned Effort	Actual Effort
1	12.0	12.5
2	15.0	11.0
3	13.0	17.0
4	8.0	9.5
5	9.5	9.0
6	18.0	19.0
7	10.0	10.0
8	4.0	4.5
9	12.0	10.0
10	6.0	6.5
11	5.0	4.0
12	14.0	14.5
13	16.0	-
14	6.0	-
15	8.0	-

Compute the SPI, schedule variance, percent schedule for completion, percent complete, CPI, and cost variance for the project.

- (b) Why is intermediate COCOMO expected to give more accurate estimates than the basic COCOMO?  
Use a schematic diagram to show the order in COCOMO estimation technique for  
(i) Cost  
(ii) Effort  
(iii) Duration.

$$6 + (3 + 3) = 12$$

**Group - E**

8. (a) What are the different types of messages used in sequence diagram? Draw the sequence diagram for printing the graduation report of university student. You must include the concept of objects (Including creating objects) and messages.

- (b) Describe the concepts of Event and Action used in state chart diagram.

$$(3 + 5) + 4 = 12$$

9. (a) Draw an activity diagram for online job portal in which job seekers 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. The system must send an acknowledgement to successful applicants. 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 must include the concept of Special states, Normal States, Swimlanes, Fork and Join.

- (b) Explain the concept of Fork and join (with examples) used in activity diagram. Differentiate between Structural diagram and Behavioral diagram.

$$6 + (4 + 2) = 12$$