



## Department of Computer Science and Engineering

**Semester:** Spring Semester 2023-24  
**Course Title:** Software Engineering  
**Full Marks:** 30  
**Semester:** MCA - 4<sup>th</sup> Semester

**Examination:** Mid Semester  
**Course Code:** CS3401  
**Duration:** 2 Hrs.  
**Course Instructor:** Dr. Neha Prema Tigga

- 1) a) Illustrate the important phases of spiral and prototype model of software development. Compare the relative merits and demerits of both. [5]
- 1) b) What is functional, non-functional and domain requirements? [5]
- 2) a) Explain in details the difference between CMM and ISO. [2]
- 2) b) Compute the functional point value for a project with following information [3]  
domain characteristics:  
Number of user inputs (I) = 50  
Number of user enquiries (E) = 18  
Number of user outputs (O) = 44  
Number of user files (F) = 30  
Number of external interfaces (EI) = 16  
It is given that out of the fourteen-complexity adjustment factor, seven factors are essential, three factors are moderate and the rest are insignificant. Assume that the weight adjustment factor is high.
- 2) c) Explain all the three formulas used to compute cyclomatic complexity. Find the cyclomatic complexity and all the independent paths for the code given below with proper control flow graph and mark the bounded region. [5]

```
0. {
1.     i = 1;
2.     while (i <= n) {
3.         j = i;
4.         while (j <= i) {
5.             if (A[i] < A[j])
6.                 swap(A[i], A[j]);
7.             j = j + 1; }
8.         i = i + 1; }
9. }
```

- 3) a) Represent the following requirement in the form of a decision tree and decision table: A library in an academic institution has four categories of members: faculty, staff, undergraduate (UG) students, and postgraduate (PG) students. A book is either a reference book or a text book. The following rule is followed for issuing a book. Only text books can be issued out. A faculty can issue up to 10 books for up to 6 months. A staff member can issue up to 8 books for up to 4 months. A PG student can issue up to 6 books for 2 months. A UG student can issue up to 4 books for 1 month. [5]

- 3) b) For the program given below calculate the Halstead's software science metrics. In a table include a list of total operators, total operands, unique operators, unique operands, the occurrences of operator and operands. Calculate program length, vocabulary, volume, difficulty, effort, program level and program length estimation. [5]

```
void insertionSort(int arr[], int n) {
    int i, key, j;
    for (i = 1; i < n; i++) {
        key = arr[i];
        j = i - 1;
        while (j >= 0 && arr[j] > key) {
            arr[j + 1] = arr[j];
            j = j - 1;
        }
        arr[j + 1] = key;
    }
}
```

\*\*\*\*\* All the best \*\*\*\*\*

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### Department of Computer Science and Engineering

**Semester:** Spring Semester 2023-24  
**Course Title:** Software Engineering  
**Full Marks:** 50  
**Semester:** MCA - 4<sup>th</sup> Semester

**Examination:** End Semester  
**Course Code:** CS3401  
**Duration:** 3 Hrs.  
**Course Instructors:** Prof. Danish Ali Khan/  
 Dr. Neha Prema Tigga

(Answer All Questions)

- 1) The normal and crash times and direct costs for the activities of a project are shown below: (10)

Activities	Time		Cost	
	Normal	Crash	Normal	Crash
1-2	5	2	6000	9000
2-4	6	3	7000	10000
1-3	4	2	1000	2000
3-4	7	4	4000	8000
4-7	9	5	6000	9200
3-5	12	3	16000	19600
4-6	10	6	15000	18000
6-7	7	4	4000	4900
7-9	6	4	3000	4200
5-9	12	7	4000	8500

Crash the project one week at a time and answer the following:

- (i) What is crashing of a project?
- (ii) Draw the network diagram.
- (iii) Determine the optimum critical path and optimum duration.
- (iv) Find the minimum cost project schedule if the indirect costs are Rs1000 per week.

2) int bin\_search (int num) (10)  
{  
 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` using the following white-box testing strategies (Show the intermediate steps in deriving the test cases):

- Statement coverage
- Branch coverage
- Condition coverage
- Path coverage

- 3) a) Explain the concept of data flow diagram in details. Write the difference between data flow diagram and flowchart. (4)
- b) Suppose you have estimated the nominal development time of a moderate sized software product to be 5 months. You have also estimated that it will cost Rs. 50,000 to develop the software product. Now, the customer comes and tells you that he wants you to accelerate the delivery time by 10%. How much additional cost would you charge the customer for this accelerated delivery? Irrespective of whether you take less time or more time to develop the product, you are essentially developing the same product. Why then does the effort depend on the duration over which you develop the product? (2)
- c) As the manager of a project to develop a product for business application, if you can estimate the effort required for the 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 in details. (2)
- d) What is an SRS document? What are the parts of an SRS document? (2)
- 4) a) Discuss object-oriented and function-oriented approaches to software design with examples. What are the main advantages of using object-oriented approach over function-oriented approach. (5)
- b) What do you mean by the terms cohesion and coupling in context of software design? List their different types. How are these concepts useful in arriving at a good design of a system? (5)
- 5) Explain briefly the following: (2×5)  
(i) CASE tools  
(ii) Coding documentation  
(iii) Reverse engineering  
(iv) Modular design  
(v) Software configuration management

\*\*\*\*\*All the best\*\*\*\*\*