Indian Institute of Engineering Science and Technology, Shibpur

B.Tech CST 7th Semester Final Examinations, December 2021

Software Engineering CS-702

Full Marks: 70 **Time: 1 hour 30 Minutes**

Attempt mandatory question no 1 and 2
and
Any 1 from the remaining 2 questions (3 or 4)

1. [Mandatory Question] Answer any six (6) from the following sub-questions **-**

[6x5 = 30]

a) What is "V" model of Software Development Life Cycle?
b) What is "behaviour driven development" and it can be applied in which kind of project?
c) State some probable 'entry' and 'exit' criteria of the Coding phase of SDLC.
d) Why black-box testing and white-box testing are complementary to each other?
e) What is the importance of coding standard that are followed in respective organization?
f) What do you understand by the terms "Software Validation" and "Software Verification"?
g) What is 'Acceptance' testing and when it is performed?
h) What is Consensus estimation technique?

2. [Mandatory Question] Answer any two (2) from the following sub-questions

[2x10 = 20]

a) A profit making IT Company delivers enterprise software products from last few years. The company recruits both fresh and experienced engineers in regular basis to fulfil the human resource need in various projects, as well to adjust the stuff attrition. The newly recruited engineers join into different projects through training program. The company follows Basic COCOMO technique to estimate the project. Assume that the size of a software product has been estimated as 30,000 lines of source code. Also, assume average salary of a software developer is Rs 55,000 per month. The company tries to maintain 23% net profit margin in their business. Determine the (i) Effort required to develop the software product, (ii) The nominal development time, (iii) Cost to develop the product and (iv) Offer price to the client to develop the product.

[10]

b) Consider the following function in C programming language, which computes the sum of all even integers (line no in following code should NOT be altered)

```
int SumOfEvenNums(int arrayElems[], unsigned char numOfElems)
1 {
2     unsigned char index = 0;
3     int sum = 0;
4     while(index < numOfElems) {
5         int tempElem = arrayElems[index];
6         if(0 == tempElem%2)
7         {
8             sum += tempElem;
9         }
10        index++;
11    }
12    return sum;
13 }
```

i. Draw the Control Flow Graph (CFG) for the above function.
ii. Compute the McCabe's Cyclomatic complexity of the above function applying all possible approaches and find all Linearly Independent Paths (LIPs) in the CFG.

[6+4 = 10]

c) Suppose you have to design a linked list that can store the student names, their roll numbers, and their GPA. Design a suitable class structure to design it. The operations to be supported are add-to-end, search, delete. The delete operation deletes a node in the linked list that matches the given on roll number. The add-to-end adds a student by creating an appropriate node. (i) Document it using UML syntax, and (ii) draw sequence diagram for the add student operation.

[5+5 = 10]

3. A software needs to develop for automating the management of a video rental store. A brief description of the Video Rental Store Software (VRSS) is as follows:

A video rental store has a large collection of video CDs and DVDs in VHS and MP4 format as well as music CDs. A person can become a member by depositing Rs. 1,000 and filling up details such as name, address, and telephone number. A member can cancel his membership and take back his deposit, if he has no dues outstanding against him. Whenever the store purchases a new item, details such as price and date of procurement are entered. The daily rental charge is also entered by the manager. After passing of a year, the daily rental charge is automatically halved. A member can, at a time, take on loan at most two video CDs and one music CD. The details are entered by a store clerk and a receipt indicating the daily rental charge should be printed by the software. Whenever a member returns his loaned item(s), the due amount to be paid is displayed. After the amount is paid, the items are marked returned. If a customer loses or damages any item, the full price of the item is charged to him and the item is removed from the inventory. If an item is not lent out by anyone for even once over a year, the item is sold at 10% of the purchase price and is removed from the inventory. The manager can, at any time, check the profit/loss account.

a) Develop use case diagram.
b) Write down the text description for each of the use-case.

[10+10 = 20]

4. A certain project can be split into 8 distinct activities A, B, …, H. The time (in weeks) to complete each activity is as given below, along with the dependencies between the tasks.

Activity	**Order / dependency**	**Estimated time (in weeks)**
A	Must be done first	5
B	Can only start when A is completed	2
C	Can only start when A is completed	8
D	Can only start when A is completed	6
E	Can only start when B is completed	3
F	Can only start when C and E are completed	3
G	Can only start when D is completed	6
H	Can only start when F and G are completed	7

a) Draw the Activity Network for the project following AOA approach
b) For each activity, compute the following parameters so that the overall project can be completed as early as possible -
   i. Earliest time at which it can start
   ii. Latest time at which the activity must start
   iii. Slack time
c) Find the Critical Path and minimum time to complete the project.

[8 + 8 + 4 = 20]