20/11/19

Indian Institute of Engineering Science and Technology, Shibpur
B.Tech 7th Semester (CST) Examination 2019
Under 5-year Dual-Degree (B. Tech-M. Tech) Programme
Software Engineering CS-702

Full marks: 70 Time: 3 hours

All parts of a question are to be answered together
Questions 1 and 2 are mandatory and answer any 3 from the rest

1. [Mandatory Question] Answer all questions.
   a) What is software redundancy? How does it help in achieving the requirements of fault tolerant systems?
   b) How does the principles of Extreme Programming (XP) are consistent with the "Agile Manifesto"? Explain with justification.
   c) Consider XYZ.com is a company which is consisting of few departments. The departments are located in one or more offices and one such office designated as headquarter. Each department has a manager who is recruited from the set of employees. Design a Class diagram for this problem.

   [5 + 7 + 7] = 19

2. [Mandatory Question] Answer any 7 questions (not exceeding 7) out of 10 in brief.
   a) What is "V" model of Software Development Life Cycle?
   b) Name few types of testing which are used to test non-functional requirements.
   c) What is the importance of coding standard that are followed in respective organization?
   d) How Intermediate COCOMO mitigates the drawbacks of Basic COCOMO model?
   e) What is Decision Table technique to specify software requirements?
   f) Explain the terms, statement coverage, branch coverage, and path coverage.
   g) What are the differences between White Box and Black Box Testing?
   h) What are the challenges involved in Error Seeding technique?
   i) What are the limitations of Data Flow Diagram (DFD)?
   j) Explain the State Chart Diagram in the context of software modelling.

   [7 x 3] = 21

3. a) In UML, why Usecase diagram factoring is needed? What are the differences between <<include >> and <<extend>> relationship in UML Usecase factoring? Explain with an example.
   a) Explain how code integration is performed in mixed or sandwich approach of code integration? Mention the use of Structure chart in this context.

   [5 + 5] = 10

4. a) How can you determine whether a given design is modular or not?
   b) Describe various kinds of cohesiveness using suitable example.

   [4 + 6] = 10

5. A certain project can be split into 9 distinct activities A, B, ..., I. The time (in weeks) to complete each activity is as given below, along with the dependencies among the activities.

Activity	Order / dependency	Estimated time (in weeks)
A	Must be done first	8
B	Can only start when A is completed	6
C	Can only start when A is completed	7
D	Can only start when B is completed	8
E	Can only start when C is completed	11
F	Can only start when C is completed	2
G	Can only start when D and E are completed	3
H	Can only start when F is completed	10
I	Can only start when G and H are completed	5

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.

[4 + 4 + 2] = 10

6. Consider the following function in C programming language

```
int computeSum( int arrayElems[],
                int excludeElem,
                unsigned char numOfElems)
{
    unsigned char index = 0;
    int sum = 0;
    while(index < numOfElems) {
        int tempElem = arrayElems[index];
        if((0 == tempElem%2) && (tempElem != excludeElem))
        {
            sum += tempElem;
        }
        index++;
    }
    return sum;
}
```

a) Draw the Control Flow Graph (CFG) for the above function.

b) Compute the McCabe's Cyclomatic complexity of the above function applying all possible approaches and find all Linearly Independent Paths (LIPs) in the CFG.

[5 + 5] = 10