Indian Institute of Engineering Science and Technology, Shibpur
B.E. (CST) 7th Semester Examination 2015

Software Engineering (CS - 701)

Time: 3 hours **Full marks: 70**

Use same answer booklet to attempt questions from all groups.
All parts of a question are to be answered together.

Group A
Answer all questions from this group (5x2 = 10 marks)

1. **[Mandatory Question]** State TRUE or FALSE of the following -

   a) The *Stress testing* is a kind of *Performance Testing*.
   b) The *CRC card* is a brainstorming tool defined in *UML*.
   c) The *Stamp coupling* is encouraged in software design.
   d) The *error seeding* is a technique to test Software effectively.
   e) In OOAD, the *Entity objects* handles most important logic involved in usecase realization.

   [5 x 1] = 5

2. **[Mandatory Question]** Mention the correct answer -

   a) Which of the following is/are not member(s) of DFD
   (i) Process (ii) Data store (iii) Predicate node (iv) External Entity

   b) Consider the sentence: "*A book has one or more page(s)*". Which of the following concepts characterize it best in Class relationship?
   (i) Inheritance (ii) Specialization (iii) Association (iv) Composition

   c) How many nodes will be there in an un-optimized CFG that represents following code snippet -

```
sum = 0;
for(index = 5; index <= 40; index++) {
   sum += i;
}
```

   (i) 3 (ii) 4 (iii) 5 (iv) 6

   d) A software organization has been assessed at SEI CMM Level 4. Which of the following is a prerequisite to achieve Level 5?
   (i) Defect Detection (ii) Defect Prevention
   (iii) Defect Isolation (iv) Defect Propagation

   e) Which one of the following types of program modules is normally used to design integration test plan?
   (i) CFG (ii) DFD (iii) Structure chart (iv) State Chart

   [5 x 1] = 5

Group B

Attempt 2 questions from this group (15x2 = 30 marks)

3. Consider the following function in C programming language, which computes the sum of max and min integers in a list (*line no mentioned in following code should NOT be altered*)

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

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.
c) Suggest different White Box test-cases those cover each of these LIPs.

[5 + 7 + 3] = 15

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	5
G	Can only start when D is completed	4
H	Can only start when F and G are completed	7

a) Draw the Activity Network for the project following the convention of AOA and AON.
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.

[6 + 7 + 2] = 15

5. An engineering college offers B.Tech and M.Tech degrees in three branches – Electronics, Electrical and Computer science & engineering. Each branch can admit 30 B.Tech and 10 M.Tech students each year. To complete B.Tech degree student has to clear all 25 core and 5

elective subjects and 1 project; and to complete M.Tech degree student has to clear all 5 core and 5 elective subjects and 1 project.

a) Identify all Classes involved in the above mentioned fact.
b) Draw a class diagram using the UML Syntax to represent above fact, mentioning -
   i. Every class with attributes and declaration of important behaviors with access specifiers.
   ii. The relationship between Classes using standard UML notation and cardinality.

[5+ (5+5)] = 15

Group C

Attempt any 3 questions from this group (10x3 = 30 marks)

6. a) Describe briefly the different stages of Rapid prototype model. Mention applicability of this model.
   b) What are the properties of good SRS document?
   c) Mention the content of SRS documents in brief.

[6 + 2 + 2] = 10

7. a) Specify which kind of programming errors can be uncovered by "Code Inspection" technique?
   b) Explain UML Sequence Diagram using a suitable example.

[4 + 6] = 10

8. 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 makeup the stuff attrition. The newly recruited engineers join into different projects through training program. The company follows Basic COCOCO technique to estimate the project. Assume that the size of a software product has been estimated as 35,000 lines of source code. Also, assume average salary of a software developer is Rs 45,000 per month. The company tries to maintain 20% *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.

   b) What is Intermediate COCOMO?

[8 + 2] = 10

9. a) What are Black-box and White-box testing? Explain with example.
   b) Give a brief description on how "Top-down" integration is performed. Mention advantages and disadvantages of this approach

[5 + 5] = 10

10. Write short notes on following -
   a) ISO 9000
   b) Agile Process Model

[5x2] = 10