Motilal Nehru National Institute of Technology Allahabad
Department of Computer Science and Engineering
END Semester Examination (May, 2018), Common for both B. Tech CSE and IT VI Semester

Subject Name & Code: Software Engineering (CS1606) **Time: 03:00 hrs** **Max. Marks: 60**

Answer all the following Questions. Be specific and to the point in your answers. Make assumptions wherever necessary and quote it.

Section 1: Each of the following questions carries 3 marks. (10*3 = 30 marks)

1. What is black box testing? Explain in detail with its advantages and disadvantages.
2. When do we use Spiral Model? Illustrate its advantages with a suitable example.
3. Define Coupling and Cohesion and differentiate them.
4. What is Big Data Software Engineering? Describe in short.
5. List out the uses of activity diagram? And draw an activity diagram for online bus ticket issuing system.
6. How do you verify and validate software project? Define and explain the various methods/techniques to perform them?
7. What is integration testing? What are the various integration techniques available? Explain in detail.
8. What is a Test Case? Explain in detail listing its key advantages and also define Test Scripts and Test Suites.
9. Explain Agile Unified Process in detail with a suitable example.
10. Discuss System reliability engineering and explain its categories with suitable examples.

Section 2: Each of the following questions carries 5 Marks. (6*5 = 30 marks)

1 a. What are the different code coverage challenges? How do we achieve complete code coverage in white box testing? Explain in detail. Considering the code fragment shown in Figure 1, list out the test cases which give 100% code/decision coverage? (2.5m)

b. Suggest why it is important to make a distinction between developing the user requirements and developing system requirements in the requirements engineering process. (2.5m)

2 You and several friends are about to prepare a lasagna dinner. The tasks to be performed, their immediate predecessors, and their estimated durations are as follows: (5m)

Task	Task Description	Tasks that Must Precede	Time
A	Buy the mozzarella cheese*		30 minutes
B	Slice the mozzarella	A	5 minutes
C	Beat 2 eggs		2 minutes
D	Mix eggs and ricotta cheese	C	3 minutes
E	Cut up onions and mushrooms		7 minutes
F	Cook the tomato sauce	E	25 minutes
G	Boil large quantity of water		15 minutes
H	Boil the lasagna noodles	G	10 minutes
I	Drain the lasagna noodles	H	2 minutes
J	Assemble all the ingredients	I, F, D, B	10 minutes
K	Preheat the oven		15 minutes
L	Bake the lasagna	J, K	30 minutes

*There is none in the refrigerator.

(a) Construct the project network for preparing this dinner.
(b) Find all the paths and path lengths through this project network. Which of these paths is a critical path?
(c) Find the earliest start time and earliest finish time for each activity.
(d) Find the latest start time and latest finish time for each activity.
(e) Find the slack for each activity. Which of the paths is a critical path?
(f) Because of a phone call, you were interrupted for 6 minutes when you should have been cutting the onions and mushrooms. By how much will the dinner be delayed? If you use your food processor, which reduces the cutting time from 7 to 2 minutes, will the dinner still be delayed?

3 a. Write a set of non-functional requirements for the ticket-issuing system, setting out its expected reliability and response time. Possible non-functional requirements for the ticket issuing system include: (2.5m)

- Between 0600 and 2300 in any one day, the total system down time should not exceed 5 minutes.
- Between 0600 and 2300 in any one day, the recovery time after a system failure should not exceed 2 minutes.
- Between 2300 and 0600 in any one day, the total system down time should not exceed 20 minutes.

b. Describe Mutation Testing and Selenium Testing in detail with a suitable. (2.5m)

4 What is Cyclomatic complexity? Define the Steps to find Cyclomatic complexity using a control flow graph. What are the different approaches to find Cyclomatic complexity? Construct a CFG for the sample code shown in Figure-2 and list out the various paths by estimating the Cyclomatic complexity. (5m)

5 a. Why Agile Software development process is more prominent than existing development systems like waterfall and v-model? How Scrum helps the Agile development to be more accurate? Explain in detail with a suitable figure illustration. (3 m)

(P.T.O)

You are a tester in a Scrum team. You have been testing the product for several iterations and you are noticing that the error message format and text are inconsistent. For example, when the user enters an invalid address in one part of the application, they are given the message "Invalid input" in a red font whereas when they enter an invalid phone number they are given the message "The phone number you have entered is not in a valid format. Please enter the phone number as (XXX) XXX-XXXX" in a blue font. The stories do not specify how the error messages should appear. What should you do? (2 m)

6 If banking software project uses 50KLOC of code and have 6 screens with 5 views each, 9 data tables, 4 reports including 6 sections each from 9 tables. It has 15% reuse code of object points. The scale factor (B) has low precedent-ness, high development flexibility, low process maturity and low team cohesion while other factors are nominal. Consider the design cost drivers like High Execution Time Constraint (TIME), Very High Programmer Experience (PEXP), High Database Size (DATA), Very High Analyst Capability (ACAP), Low Required Reusability (RUSE) and all other cost drivers are nominal. Calculate the effort in person months for the development of this project in Early Design Model and Post-architecture Model. (*Consider the Cost Driver Multipliers given in Table-1 and Table-2.*) (2.5m)

Discover ambiguities or omissions in the following statement of requirements for part of a ticket-issuing system: An automated ticket-issuing system sells rail tickets. Users select their destination and input a credit card and a personal identification number. The rail ticket is issued and their credit card account charged. When the user presses the start button, a menu display of potential destinations is activated, along with a message to the user to select a destination. Once a destination has been selected, users are requested to input their credit card. Its validity is checked and the user is then requested to input a personal identifier. When the credit transaction has been validated, the ticket is issued. (2.5m)

```
if   width > length
then   biggest_dimension = width
if   height > width
then   biggest_dimension = height
end_if
else   biggest_dimension = length
if   height > length
then   biggest_dimension = height
end_if
end_if
```

Figure 1: Code Segment 1

```
float determinant (float a[25][25], float k)
{
float s = 1, det = 0, b[25][25]; int i, j, m, n, c;
if (k == 1) return (a[0][0]);
else
 { det = 0;
for (c = 0; c < k; c++)
 { m = 0; n = 0;
 for (i = 0; i < k; i++)
 {  for (j = 0; j < k; j++)
    {   b[i][j] = 0;
        if (i != 0 && j != c)
          b[m][n] = a[i][j];
        if (n < (k - 2))     n++;
        else    {    n = 0;    m++;    }  }  }
 } det = det + s * (a[0][c] * detrminant(b, k - 1));
  s = -1 * s;  } } return (det); }
```

Figure 2: Code Segment 2

Cost Drivers	Rating					
	Very Low	Low	Nominal	High	Very High	Extra High
Product Attributes						
Required software reliability	0.75	0.88	1.00	1.15	1.40	
Database size		0.94	1.00	1.08	1.16	
Product complexity	0.70	0.85	1.00	1.15	1.30	1.65
Computer Attributes						
Execution time constraint			1.00	1.11	1.30	1.66
Main storage constraint			1.00	1.06	1.21	1.56
Virtual machine volatility*		0.87	1.00	1.15	1.30	
Computer turnaround time		0.87	1.00	1.07	1.15	
Personnel Attributes						
Analyst capabilities	1.46	1.19	1.00	0.86	0.71	
Applications experience	1.29	1.13	1.00	0.91	0.82	
Programmer capability	1.42	1.17	1.00	0.86	0.70	
Virtual machine experience*	1.21	1.10	1.00	0.90		
Programming language experience	1.14	1.07	1.00	0.95		
Project Attributes						
Use of modern programming practices	1.24	1.10	1.00	0.91	0.82	
Use of software tools	1.24	1.10	1.00	0.91	0.83	
Required development schedule	1.23	1.08	1.00	1.04	1.10	

Table -1

Cost Driver	Rating					
	Very Low	Low	Nominal	High	Very High	Extra High
RELY	0.75	0.88	1.00	1.15	1.39	
DATA		0.93	1.00	1.09	1.19	
CPLX	0.75	0.88	1.00	1.15	1.30	1.66
RUSE		0.91	1.00	1.14	1.29	1.49
DOCU	0.89	0.95	1.00	1.06	1.13	
TIME			1.00	1.11	1.31	1.67
STOR			1.00	1.06	1.21	1.57
PVOL		0.87	1.00	1.15	1.30	
ACAP	1.50	1.22	1.00	0.83	0.67	
PCAP	1.37	1.16	1.00	0.87	0.74	
PCON	1.24	1.10	1.00	0.92	0.84	
AEXP	1.22	1.10	1.00	0.89	0.81	
PEXP	1.25	1.12	1.00	0.88	0.81	
LTEX	1.22	1.10	1.00	0.91	0.84	
TOOL	1.24	1.12	1.00	0.86	0.72	
SITE	1.25	1.10	1.00	0.92	0.84	0.78
SCED	1.29	1.10	1.00	1.00	1.00	

Table - 2

******* End *******