Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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A Constituent Institution of Manipal University

V SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: SOFTWARE DESIGN TECHNOLOGY [ICT 3155]

REVISED CREDIT SYSTEM
(24/11/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Explain the accomplishment of requirements engineering process through the execution of seven distinct functions. 5

1B. With a neat diagram explain the steps involved in the Rapid Application Development process model. 3

1C. Draw a sequence diagram for "Renew books with fine generation for late renewal". 2

2A. Draw the class diagram by identifying the classes using noun phrase approach for the following.

A transport company requires automating its various operations. The company has a fleet of vehicles. Currently the company has the following vehicles

Ambassadors	:	10 non-AC, 2 AC
Tata Sumo	:	5 non-AC, 5 AC
Maruti Omni	:	10 non-AC
Maruti Esteem	:	10 AC
Mahindra Arm	:	10 non-AC

The company rents out vehicles to customers. When a customer requests for a car, the company lets him know what types of vehicles are available, and what the charges for each car are. For every car, there is a per hour charge, and a per kilometer charge. A car can be rented for a minimum of 4 hours. The amount chargeable to a customer is the maximum of (per hour charge for the car times the number of hours used, and per kilometer charge times the number of kilometers run) subject to a minimum amount decided by the charge for 4 hours use of the car. An AC vehicle of a particular category is charged 50% more than a non-AC vehicle of the same category. There is a charge of Rs. 150 for every night halt regardless of the type of the vehicle. When a customer books a car, he has to deposit an advance amount. The customer also informs the company when he expects to return the car. When the car is returned, depending on the usage, either the customer is refunded some amount, or he has to pay some additional amount to cover the total cost incurred. The company can acquire new vehicles and add them to the fleet of its vehicles. Cars may be condemned and sold off as well. A car 5

which is currently with the company can be in any one of these three states: under repair, available for rent, rented out. If it is rented out, the company records the data and time of renting out, and the kilometer reading at the time of renting out. The company also wants to maintain the record of maintenance expenditure incurred in respect to each vehicle. The company wants to collect statistics about various types of vehicles: the price of the car, average amount of money spent on repairs for the car, average demand, revenue earned by renting out the car, and fuel consumption of the car. Based on these statistics, the company grades the vehicles as per their profit-earning potential. These statistics can also be used to decide the charge for different types of vehicles.

2B. Figure Q.2B represents access graphs of two modules *M1* and *M2*. The filled circles represent methods and the unfilled circles represent attributes. If method *m* is moved to module M2 keeping the attributes where they are, what can we say about the average cohesion and coupling between modules in the system of two modules.

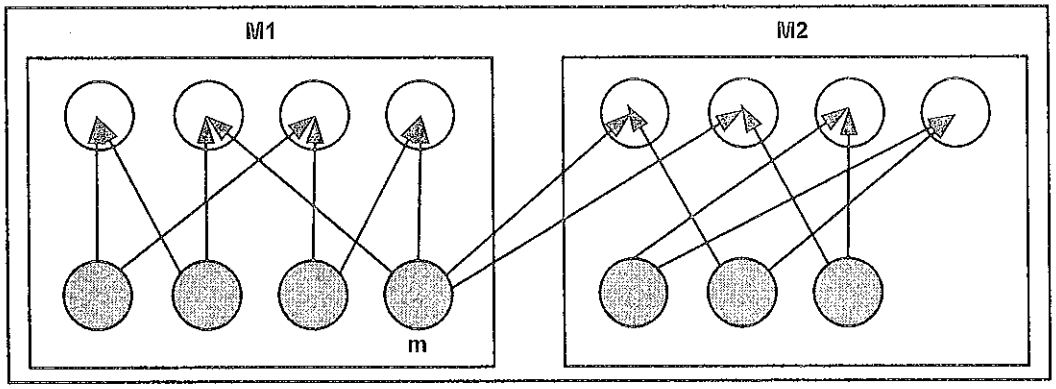

Figure Q.2B 3

2C. Write any two differences between refactoring and refinement. 2

3A. Draw the state machine diagram for the following.
In a multitasking computer system, processes may occupy a variety of states. When a process is first created, it occupies the new state. In this state, the process awaits admission to the waiting state. A waiting process has been loaded into main memory and is awaiting execution on a CPU. Other processes that are waiting for an event to occur, such as loading information from a hard drive or waiting on an internet connection, are not in the ready queue. A process moves into the running state when it is chosen for execution. But due to interrupt or exceeding time limit the process will back to waiting state again. A process that is blocked on some event such as I/O operation completion may be blocked due to exhausting its CPU time allocation. A process may be terminated, either from the running state by completing its execution of by explicitly being killed. In either of these cases, the process moves to the terminated state. A process may be swapped out, that is, removed from main memory and places on external storage by the scheduler which is also called suspend waiting. From here the process may be swapped back into the waiting state. Processes that are blocked may also be swapped out. In this event the process is suspend blocked, and may be moved back to the blocked state and may still be waiting for a resource to become available. 5

3B. What are the steps involved in the risk estimation and management? 3

3C. An HR department of company is following employment process where applications 2

are sorted out based on a person's age. A person under age 18 as well as senior citizen older than age 58 is not eligible to hire. Person less than age 21 can be hired on a part-time basis only. Adult persons age 21 or above can hire as full time employees. Design test cases using equivalence portioning and boundary value analysis for above scenario.

4A. Consider the following pseudo code:

```
public void Function(int[] intArray)
{
  for (int i = 0; i < intArray.Length; i++)
  {
    Console.WriteLine(intArray[i]);
  }
  int temp, j;
  for (int i = 1; i < intArray.Length; i++)
  {
    temp = intArray[i];
    j = i - 1;
    while (j >= 0 && intArray[j] > temp)
    {
      intArray[j + 1] = intArray[j];
      j--;
    }
    intArray[j + 1] = temp;
  }
  for (int i = 0; i < intArray.Length; i++)
  {
    Console.WriteLine(intArray[i]);
  }
}
```

i) Draw the CFG for the pseudocode.
ii) Find the cyclomatic complexity for the CFG, in terms of regions, edges and predicate nodes.
iii) Find the independent execution paths.
iv) Write the test cases for the identified independent paths. 5

4B. With the help of an example draw a neat diagram to explain the significance of stress testing in developing the software. 3

4C. Assume the size of complex type software has been estimated to be 60,000 lines of source code, and the average salary of software engineers be Rs. 30,000/- per month. Determine the following:

i) Effort required for developing the software.
ii) The nominal development time.
iii) Total cost required to develop the software.

Note: a = 3.6, b = 1.2, c = 2.5, d = 0.32 2

5A. Draw the activity network representation for the project given in figure Q.5A and compute the following. (Consider T12 as final task)

i) Identify the critical path and its duration for the given project.
ii) Identify slack time of task T3, T6 and T12.
iii) Identify latest finish time of Task T5
iv) Identify latest start time of Task T10 5

Task name	Duration(days)	Dependencies
T1	8	-
T2	15	-
T3	15	T1
T4	10	-
T5	10	T2,T4
T6	5	T1,T2
T7	20	T1
T8	25	T4
T9	15	T3,T6
T10	15	T5,T7
T11	7	T9,T10
T12	10	T8,T10,T11

Figure Q.5A

5B. What is Agility? With a neat diagram explain any one agile process. 3

5C. What is mutation testing? Explain any one class mutation operator for object-oriented program. 2