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TIME: 3 HOU	RS				14/05/2	016						MA	X. M	ARK	S: 50

Instructions to candidates

- Answer any FIVE FULL questions.
- Missing data, if any, may be suitably assumed.
- 1A. A transport company requires to automate its various operations. The company has a fleet of vehicles. Currently the company has the following vehicles
 - Ambassadors:10 non-AC, 2 ACTata Sumo:5 non-AC, 5 ACMaruti Omni:10 non-ACMaruti 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 kilometre 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 kilometre charge times the number of kilometres 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 which is currently with the company can be I 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 kilometre 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 profitearning potential. These statistics can also be used to decide the charge for different types of vehicles. Identify the classes using noun phrase approach for the problem statement given above and draw the detailed class diagram for the same.

1B. explain the following software design concepts emphasizing their use and need with relevant example

- i) Abstraction and data hiding
- ii) Modularity
- iii) Fan-in and fan-out

1C. Differentiate between verification and validation in the context of software testing. (5+3+2)

2A. Consider the pseudo code in the figure Q.2A

1. i = 0: 2. n=4; //n- number of nodes present in the graph 3. while (i<n-1) do 4. i = i + 1;5. **while** (j<n) do 6. if A[i] < A[j] then 7. swap(A[i], A[j]); 8. end do: 9. i=i+1;10. end do;

Figure Q.2A

- i) Draw the CFG for the pseudo-code.
- 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.
- 2B. Draw the Swim-lane diagram for the University Department Information System. The summary of the requirements is as follows.

Various details regarding each student such as his name, address, course registered, etc. are entered at the time he/she takes admission. At the beginning of every semester, students register for courses. The information system should allow the department secretary to enter data regarding student registrations. When the secretary enters the roll number of each student, the computer system should bring up a form for the corresponding student and should keep track of courses he has already completed and the courses he has back-log, etc. At the end of the semester, the instructors leave their grading information at the office which the secretary enters into the computer. The information system should be able to compute the grade point average for each student for the semester and his cumulative grade point average (CGPA) and print the grade sheet for each student. The information system should also keep track of inventories of the Department, such as office equipment, furniture, etc. The information system should also keep track of the research projects running in the Department, publications by the faculties etc.

2C. Explain the significance of found and lost message in sequence diagram with suitable example.

(5+3+2)

- 3A. Draw the activity network representation for the project given in figure Q.3A 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 early start time of Task T5
 - iv) Identify latest start time of Task T10

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 0.3A								

3B. Explain three different types of control structure testing with necessary examples.

3C. What motivated software engineers to move from the waterfall model to incremental or spiral model.

(5+3+2)

(5+3+2)

- 4A. Differentiate state and event. Also list the types of events. Identify states and events of a Photocopier (Xerox) machine from the description given below and draw the state diagram for the same. Initially the machine is off. When the operator switches on the machine, it first warms up during which it performs some internal tests. Once the tests are over, machine is ready for making copies. When operator loads a page to be photocopied and press 'start' button, machine starts making copies according to the number of copies selected. While machine is making copies, machine may go out of paper. Once operator loads sufficient pages, it can start making copies again. During the photocopy process, if paper jam occurs in the machine, operator may need to clean the path by removing the jammed paper to make the machine ready.
- 4B. What is a spiral Process model. Explain the model with two advantages and two disadvantages.
- 4C. Bring out the difference between regression and smoke testing
- 5A. Draw the use-case diagram for the Auditorium Management Software. The summary of the requirements is as follows.

Various types of social and cultural events are conducted in the auditorium. There are two categories of seats: balcony and ordinary seats. Normally, the balcony seats are more expensive in any show. The show manager fixes the prices of these two categories of seats depending on the popularity of a show. The show manager also determines the number of balcony and ordinary seats that can be put on sale, since for each show some seats are offered as complimentary gifts to different functionaries of the students' society and to VIPs. The show manager also enters the show dates, the number of shows on any particular data and the show timings. The spectators book their seats in advance by paying the full ticket price to the authorized salespersons. The spectators indicate the type of the seat, and the computer should therefore print out the ticket clearly showing the seat numbers. The spectators can cancel their booking before three clear days of the show. In this case the ticket price is refunded after deducting Rs. 5 as the booking charge. If a ticket is returned later but before one day of a show, a booking charge of Rs. 10 is deducted for ordinary tickets and Rs. 15 for balcony tickets. The system should let the spectators query the availability of different classes of seats. The show manager creates login accounts for authorized salespersons. When any authorized salesperson logs in and makes a sale, the computer should record the salesperson's id in the sales transaction. This information would help in computing the commission payable to each salesperson and also the amount collected by each salesperson. These data can be queried by the show manager.

- 5B. Describe the incremental model of software development. Give any two examples of scenarios for which this approach is suitable.
- 5C. Assume that the size of an embedded type software product has been estimated to be 64,000 lines of source code. Assume that the average salary of software engineers be Rs. 18,000/- per month. Determine the effort required to develop the software product and the nominal development time.

(5+3+2)
