CONTINUOUS ASSESSMENT TEST
Model Question Paper

Programme	:	**Online MCA**	Semester	:	**I**
Course Title	:	**Data Structures and Algorithms**	Course Code	:	**OLMCA503**
Faculty	:		Class Nbr	:	
Duration	:	**60 Min**	Max. Marks	:	**30**

PART – A

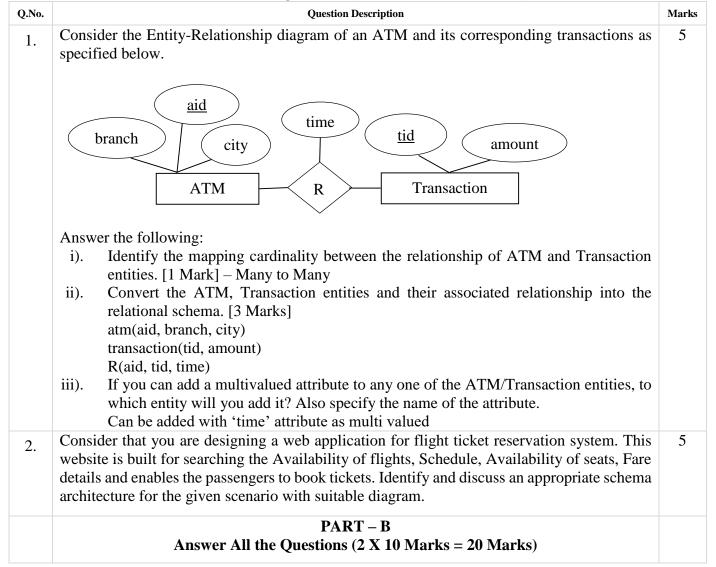### Answer All the Questions (2 X 5 Marks = 10 Marks)

Q.No.	Question Description	Marks
1.	Given a sequence of matrices with their respective dimensions (A, B, C, and D), design an efficient algorithm using dynamic programming to determine the minimum number of scalar multiplications required to compute the final product. Additionally, identify the optimal parenthesization (multiplication order) to achieve the minimum possible cost. Analyze the time complexity of the algorithm. Consider the example of matrices A (10x20), B (20x30), C (30x5), and D (5x60).	5
2.	Give the routine to push and pop an element from a Stack using array implementation. Suppose you use the Stack to evaluate the postfix expression A B ^ E - C D ^ /, where A = 6, B = 2, C = 5, D = 2, and E = 5. Assume you scan the expression from left to right. What is the element on top of the stack when you encounter the symbol 'C'?	5
	PART – B **Answer All the Questions (2 X 10 Marks = 20 Marks)**	
3.	Imagine you're managing a library and want to create a digital system to track books. Design a code using a singly linked list to store book information (title, author, ISBN). Implement functions to efficiently: Add new books: Represent new acquisitions by adding them to the list's end. Return borrowed books: Simulate book returns by removing the first book and adding it back to the end, marking it available again. Write code for: (i). insert_at_end: Inserts a new book node at the list's end. (ii). delete_first: Removes and returns the first book node. Analyze the time complexity of each function for efficiency evaluation.	10
4.	Write a binary search algorithm and trace its execution to search for the element 91 in the following list: 13, 30, 62, 73, 81, 88, 91. Additionally, discuss the limitations of binary search. Furthermore, identify the group of numbers that correctly represents the sequence of comparisons used to find the key 62. Analyze the time complexity.	10

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CONTINUOUS ASSESSMENT TEST
Model Question Paper

Programme	:	**Online MCA**	Semester	:	**I**
Course Title	:	**Database Management Systems**	Course Code	:	**OLMBA505**
Faculty	:		Class Nbr	:	
Duration	:	**60 Min**	Max. Marks	:	**30**

PART – A
Answer All the Questions (2 X 5 Marks = 10 Marks)

Q.No.	Question Description	Marks
1.	Consider the Entity-Relationship diagram of an ATM and its corresponding transactions as specified below. Answer the following: i). Identify the mapping cardinality between the relationship of ATM and Transaction entities. [1 Mark] – Many to Many ii). Convert the ATM, Transaction entities and their associated relationship into the relational schema. [3 Marks] atm(aid, branch, city) transaction(tid, amount) R(aid, tid, time) iii). If you can add a multivalued attribute to any one of the ATM/Transaction entities, to which entity will you add it? Also specify the name of the attribute. Can be added with 'time' attribute as multi valued	5
2.	Consider that you are designing a web application for flight ticket reservation system. This website is built for searching the Availability of flights, Schedule, Availability of seats, Fare details and enables the passengers to book tickets. Identify and discuss an appropriate schema architecture for the given scenario with suitable diagram.	5
	PART – B **Answer All the Questions (2 X 10 Marks = 20 Marks)**	

3.	Construct an ER diagram for the given requirements. • Products identified with ProductID, Name, Price, QuantityAvailable • Customers identified with CustomerID, Name, Email, Address • Orders identified with OrderID, Date, TotalAmount • A customer can place multiple orders and each order is associated with one customer. • A product can be part of multiple orders and each order can have multiple products. • Every order must be placed by a customer and every product must be included in an order. • Consider adding a "Payment" entity as a weak entity, dependent on the "Order" entity. Each payment can have a unique transaction ID, payment method, and amount. • Include a multivalued attribute like "Attributes" for products, capturing additional features that vary for each product. • Break down the address of the customer name into first_name, middle_name and last_name. • Introduce a derived attribute like "OrderStatus" for orders, based on the status of individual products within the order. • Include a descriptive attribute like "Description" for products. • In the relationship between a customer and an order, the customer can play the role of "Buyer," and the order can play the role of "Placed Order." Similarly, in the relationship between a product and an order, the product can play the role of "Ordered Product," and the order can play the role of "Order Items."	10
4.	Consider the student schema identified by the student_id, student_name, email, city and cgpa. Write the Relational Algebra expressios for the following: i. List the student details who have scored more than 6 cgpa and less than 8 cgpa. [2 Marks] - select ii. List the student details who are from either Chennai or Delhi. [2 Marks] - select iii. List the name and email id of the student who doesn't lived in Mumbai. [2 Marks] - project iv. List the student details whose name starts with 's' [2 Marks] - select v. List the register number of the student whose email is null [2 Marks] - project	10

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Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

CONTINUOUS ASSESSMENT TEST					
Model Question Paper					
Programme	:	**Online MCA**	Semester	:	**I**
Course Title	:	**Operating Systems**	Course Code	:	**OLMCA504**
Faculty	:		Class Nbr	:	
Duration	:	**60 Min**	Max. Marks	:	**30**

PART – A
Answer All the Questions (2 X 5 Marks = 10 Marks)

Q.No.	Question Description	Marks
1.	Consider an application of two different operating systems of your choice (For example, the usage of media players in ios and android). Distinguish the pros and cons of those features in detail.	5
2.	Write a C program with a fork to find "whether a given number is ODD or EVEN"?	5
	PART – B **Answer All the Questions (2 X 10 Marks = 20 Marks)**	

3.	Assume that 5 students S1, S2, S3, S4 and S5 are willing to access the Internet in a system. S1 needs the system for 5 ms, S2 for 3 ms, S3 for 9 ms, S4 for 4 ms and S5 for 7 ms. Allow them to access the system based on their CGPA 8.2, 7.3, 8.5, 9.2 and 7.9 respectively.
	Allow the students based on the following scenario:
	    (a) Students with Higher CGPA should be allowed first. Display the average turnaround time and the average waiting time. (4 Marks)
	    (b) Every student has to be allowed for a quantum period of 3 ms evenly. Display the average turnaround time and average waiting time. (6 Marks)
		10

4.	A programmer has a gaming code. Any number of players can play the game at the same time, but the single programmer alone can modify the code of the game. The constraint is that, when a programmer is modifying the code, no players or other programmers are supposed to play or modify the code respectively. Identify the synchronization problem and explain it with the appropriate algorithms using semaphores.	10

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CONTINUOUS ASSESSMENT TEST
Model Question Paper

Programme	:	**Online MCA**	Semester	:	**I**
Course Title	:	**Python Programming**	Course Code	:	**OLMCA502**
Faculty	:		Class Nbr	:	
Duration	:	**60 Min**	Max. Marks	:	**30**

PART – A

Answer All the Questions (2 X 5 Marks = 10 Marks)

Q.No.	Question Description	Marks
1.	Using Python, calculate the Gross Salary of an employee based on the following allowences and deductions. Get Basic Salary of Employee as User input. DA = 20% of Basic, HRA = 10% of Basic, PF = 12% of Basic, TA = 5.50% of Basic. Net Pay = Basic + DA + HRA + TA Gross Pay = Net Pay - PF.	5
2.	Write a Python program to reverse an integer number. For eg., user input is 57826, the expected output is 62875.	5
	PART – B **Answer All the Questions (2 X 10 Marks = 20 Marks)**	
3.	Assume you have started the course registration process for the Second semester of your PG degree program. In the previous semester, if you have cleared all the subjects (>=50 in each subject) and your CGPA is ● >=8.5, you will be allowed to register for a total of 30 credits in the current semester. ● between 8.5 and 7, you will be allowed to register for a total of 25 credits in the current semester. ● between 7 and 5, you will be allowed to register for a total of 18 credits in the current semester. ● Less than 5, you will not be allowed to do new course registration, rather you will be advised to improve your previous semester CGPA.	10

	Write a python code to get the marks for three subjects in integer format. Calulate CGPA and print the relevant credit value to be registered. If CGPA<5, print the output string as: "Course Registration not allowed. Advised for CGPA improvement." Note:- CGPA = Total Percentage / 9.5	
4.	A string contains the following sentence "All our dreams can come true, if we have the courage to pursue them". Write a Python program to perform the following string operations with the given string using appropriate methods whereever necessary. (i) Remove all vowels from a string and display the string (5 Marks) (ii) Remove all the whitespace characters from the whole string. (2.5 Marks) (iii) Convert the string to all uppercase and lowercase letters. (2.5 Marks)	10

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CONTINUOUS ASSESSMENT TEST					
Model Question Paper					
Programme	:	**Online MCA**	Semester	:	**I**
Course Title	:	**Discrete Mathematical Structures**	Course Code	:	**OLMCA501**
Faculty	:		Class Nbr	:	
Duration	:	**60 Min**	Max. Marks	:	**30**

PART – A

Answer All the Questions (2 X 5 Marks = 10 Marks)

Q.No.	Question Description	Marks
1.	(a) Find the truth table for the compound proposition $(p \vee q) \rightarrow (p \wedge q)$. **(2 marks)** (b) Symbolise the expression "For any x and any y, if x is taller than y, then y is not taller than x" **(3 marks)**	5
2.	(a) Consider the set of students in Discrete Mathematical Structures class. For any two students x, y in the class, we say xRy if the difference in their exam marks is greater than 20. Check whether the relation R is antisymmetric and transitive or not. **(3marks)** (b) How many numbers must be selected from the set {2,4,6,8,10,12,14,16} to guarantee that there is at least one pair of numbers such that the sum of the two numbers is 18? **(2 marks)**	5
	## PART – B ### Answer All the Questions (2 X 10 Marks = 20 Marks)	
3.	(a) Solve the following recurrence relation using generating function: $a_n = 3a_{n-1} - 4n, \ \ n \geq 1, \ a_0 = 2.$ **(5 marks)** **(b)** Let D_{150} be the set of all divisors of 150 and	be the relation defined as $a|b$ if and only if *a divides b*. Draw the Hasse diagram. Check whether it is a Lattice or not. **(5 marks)**	10
4.	(a) Find a, b such that $546a + 432b = 6$ using extended Euclidean Algorithm. **(5 marks)** (b) Use inference theory to check the validity of the following argument: "There are people who are writers. All writers eat healthy food. All writers are happy. Hence, some people who eat healthy food are happy". **(5 marks)**	10

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