#### DATA STRUCTURE & RDBMS (MECH 3134)

**Time Allotted : 3 hrs** 

Figures out of the right margin indicate full marks.

# Candidates are required to answer Group A and <u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A (Multiple Choice Type Questions)

1.	Choo	ose the correct alter	$10 \times 1 = 10$		
	(i)	Which function plac (a) POP()	es an element on the (b) PUSH()	stack? (c) PEEK()	(d) isEmpty()
	(ii)	Degree of a leaf nod (a) 0	e is (b) 1	(c) 2	(d) 3.
	(iii)	What is the value of (a) 1	the postfix expressio (b) 40	n 6 3 2 4 + – *: (c) 74	(d) -18.
	(iv)	Pushing an element stack becomes (a) Overflow		aving five elements as (c) Underflow	nd stack size of 5, then (d) User flow.
	(v)	The postfix form of the expression $(A + B)^*(C^*D - E)^*$ (a) AB+ CD*E – FG /** (b) AB + (c) AB + CD* E – *F *G / (d) AB +			,
	<ul> <li>(vi) The operator takes the results of two queries and returns on appear in both result sets.</li> <li>(a) union (b) intersect (c) difference (d) projection</li> </ul>				eturns only rows that (d) projection
	(vii)	The information abo (a) Tera Data	out data in a database (b) Meta Data	is called (c) Hyper Data	(d) Relations.

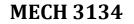
Full Marks : 70

(viii) Which of the following is not binary operation?(a) Union(b) Project(c) Set difference

(d) Cartesian Product.

- (ix) Key to represent relationship between tables is called(a) primary key(b) secondary key(c) foreign key(d) super key.
- (x) Which command is used to remove a relation from an SQL?
  (a) Drop table
  (b) Delete
  (c) Purge
  (d) Remove.

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## **Group-B**

2.	(a)	Write a function/pseudo-code to insert an it implemented using an array.	em in a queue. The queue is [(CO1)(Remember/LOCQ)]			
	(b)	Compare array and linked list.	[(CO3)(Analyze/IOCQ)]			
	(c)	Implement a C function code to delete an item in a	singly linked list at the beginning.			
		•	[(CO1)(Design/HOCQ)]			
			4 + 4 + 4 = 12			
3.	(a)	Consider the following arithmetic infix expression	on P. Convert it to its equivalent			
		postfix notation (Show all intermediate steps)	*			
		$P := A + (B / C - (D * E ^ F) + G) * H$	[(CO2)(Understand/LOCQ)]			
	(b)	Why stack data structure is called LIFO?	[(CO1)(Remember/LOCQ)]			
	(c)	Construct the following queue, where queue is a c	circular array with 6 memory cell.			
		The initial condition of queue is given below:				
		Front:=2, Rear:=4, Q:=, A, C, D,,				
Describe the queue as the following operations take place.						
		i) F is added to the queue				
		ii) 2 characters are deleted from the queue				
		iii) K, L, M are added to the queue				
		iv) R is added to the queue				
		v) One element is deleted from the queue.	[(CO4)(Understand/IOCQ)]			

5 + 2 + 5 = 12

# Group - C

4. (a) Construct a binary search tree whose nodes in inorder and preorder are given as follows (Show all intermediate steps):

Inorder : X P H S M I RJ Y G Preorder: M P X S H Y R I J G

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[(CO4)(Understand/IOCQ)]
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(b) Write an algorithm to implement sequential search on an n element array.

[(CO2)(Analyze/LOCQ)]

(c) Critically comment: Binary search is better than Linear search.

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[(CO3)(Analyze/IOCQ)]
6 + 4 + 2 = 12
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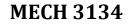
5. (a) Perform bubble sort on the given list. Show different iterations.

32, 51, 27, 85, 66, 23, 13, 57

[(CO3)(Analyze/IOCQ)]

- (b) Explain how a binary tree can be stored in memory by using the concept of linked list. [(CO1)(Understand/LOCQ)]
- (c) Construct a binary search tree for the following input list:

50,23,74,20,40,10,30,45,60,80,85,65 Then delete the nodes 10, 60, 40 from the tree and reconstruct the final binary tree. [(C01,C04)(Understand/L0CQ)]4 + 2 + (2 + 4) = 12



#### B.TECH/ME/5<sup>TH</sup> SEM/MECH 3134/2022

## Group – D

6. (a) Explain Primary key and Foreign key with example(s). [(CO4)(Remember/LOCQ)]

(b) Draw an E-R diagram for a travel agency consisting of the following: Customers, buses, drivers, conductors, guides, tickets, booking, agents, reservations, conducted tours and hotels.

Clearly describe entities, attributes, primary key and relationships.

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[(CO2)(Remember/IOCQ)]
4 + 8 = 12
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 7. (a) Consider a relational database as given below: DEPT(<u>DCODE</u>, DNAME), EMP(<u>ECODE</u>, ENAME, BASIC, DCODE, DT\_JOIN). The underlined attributes are the primary keys. Write SQL queries for the following:

- (i) For each department, show DNAME and total basic of the employees in the department.
- (ii) Find out the names of the employees who are working in the department named as 'ABC'.
- (iii) Find out the maximum basic among the employees who has joined after 2000.

[(CO5)(Analyze/IOCQ)]

(b) What do you mean by derived attributes? Explain with suitable example.

[(CO5)(Remember/LOCQ)] (4 + 3 + 3) + 2 = 12

## Group - E

8. (a) Explain insertion and updation data anomaly with proper example.

[(CO6)(Understand/LOCQ)]

(b) What are the ACID properties of a transaction? Explain. [(CO5)(Remember/LOCQ)] (3 + 3) + 6 = 12

9. (a) Draw the state diagram of transaction and describe different states.

[(CO1)(Remember/LOCQ)]

 (b) Consider each order has a unique order id for each order. The following information are stored:
 Order\_id, Order\_dt, Customer name, Customer address, Salesman name, Salesman

address and for each requested item store item code, Item name, Quantity and Rate.

Also assume the following functional dependencies. Salesman name -> Salesman address Customer name -> Customer address Order\_id -> Order\_dt, Salesman name, Customer name Order\_id, Icode -> Quantity Icode -> Iname, Rate Normalize the data structure up to 2NF showing the steps. Also mention primary key, foreign key. [(CO6)(Analyze/IOCQ)]

4 + 8 = 12

#### **MECH 3134**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	46.85	48.97	4.18

## **Course Outcome (CO):**

After completing this course, the students will be able to:

- 1. Understand and remember the basics of data structures and how time complexity analysis is applicable to different types of algorithms.
- 2. Apply different types of data structures in algorithms and understand how the data structures can be useful in those algorithms.
- 3. Analyze the behaviour of different data structures in algorithms. (For example, given an algorithm that uses a particular data structure, how to calculate its space and time complexity.
- 4. Evaluate solutions of a problem with different data structures and thereby understand how to select suitable data structures for a solution. (For example, what are the different ways to find the second largest number from a list of integers and which solution is the best.)
- 5. Formulate, using relational algebra and SQL, solutions to a broad range of query and data update problems.
- 6. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

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#### **MECH 3134**