

DATA STRUCTURE & RDBMS
(MECH 3134)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

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

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Which function places an element on the stack?
(a) POP() (b) PUSH() (c) PEEK() (d) isEmpty()
- (ii) Degree of a leaf node is
(a) 0 (b) 1 (c) 2 (d) 3.
- (iii) What is the value of the postfix expression 6 3 2 4 + – *:
(a) 1 (b) 40 (c) 74 (d) -18.
- (iv) Pushing an element into stack already having five elements and stack size of 5, then stack becomes _____
(a) Overflow (b) Crash (c) Underflow (d) User flow.
- (v) The postfix form of the expression (A+ B)*(C*D- E)*F / G is?
(a) AB+ CD*E – FG /** (b) AB + CD* E – F **G /
(c) AB + CD* E – *F *G / (d) AB + CDE * – * F *G /.
- (vi) The _____ operator takes the results of two queries and returns only rows that appear in both result sets.
(a) union (b) intersect (c) difference (d) projection
- (vii) The information about data in a database is called
(a) Tera Data (b) Meta Data (c) Hyper Data (d) Relations.
- (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.

Group- B

2. (a) Write a function/pseudo-code to insert an item in a queue. The queue is implemented using an array. [(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 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 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 R J Y G Preorder: M P X S H Y R I J G [(CO4)(Understand/IOCQ)]
 (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. [(CO3)(Analyze/IOCQ)]
6 + 4 + 2 = 12
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. [(CO1,CO4)(Understand/LOCQ)]
4 + 2 + (2 + 4) = 12

Group – D

6. (a) Explain Primary key and Foreign key with example(s). [(C04)(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.
 [(C02)(Remember/IOCQ)]
4 + 8 = 12
7. (a) Consider a relational database as given below:
 DEPT(DCODE, DNAME), EMP(ECODE, 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.
 [(C05)(Analyze/IOCQ)]
 (b) What do you mean by derived attributes? Explain with suitable example.
 [(C05)(Remember/LOCQ)]
(4 + 3 + 3) + 2 = 12

Group - E

8. (a) Explain insertion and updation data anomaly with proper example.
 [(C06)(Understand/LOCQ)]
 (b) What are the ACID properties of a transaction? Explain. [(C05)(Remember/LOCQ)]
(3 + 3) + 6 = 12
9. (a) Draw the state diagram of transaction and describe different states.
 [(C01)(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.
 [(C06)(Analyze/IOCQ)]
4 + 8 = 12

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