7. (a) Consider a relational database as given below:
   Flight(<u>flight_no</u>, flight_name, start_airport)
   Seat(<u>seat-no, flight-no</u>, type, price)
   Schedule(<u>flight-no</u>, day_of_week, type)
   where the underlined attributes are the primary keys.
   Write SQL queries for the following:
   i) Find all the flight names starting from station "ABC".
   ii) List the price and type of all seats of "PQR" flight.
   iii) List the flight number and price of all "business" (type) seats with price below ₹ 6000/-
   iv) Find all those flight names which are scheduled to run on Saturdays and Sundays (i.e. day_of_week)

   (b) Describe the three-level architecture of DBMS.

   **(2 × 4) + 4 = 12**

### Group – E

8. (a) What is Normalisation?
   What normal form is the following relation in?
   Relation Stuff(<u>D</u>, <u>O</u>, N, T, C, R, Y) FD's are DO → NTCRY, CR → D, D → N.

   (b) Find candidate keys for R(ABCDEF) with following FD's
   **AB → C, C → DE, E → F, F → B, E → A.**

   (c) Describe the different states of a transaction life cycle.

   **(2 + 3) + 4 + 3 = 12**

9. (a) Explain serial and serializable schedule with example.

   (b) Illustrate the principles of deadlock avoidance and recovery in database transaction.

   (c) What is two-phase locking protocol? How does it guarantee serializibility?

   **4 + 4 + (1 + 3) = 12**

## DATA STRUCTURE AND RDBMS
### (CSEN 3206)

**Time Allotted : 3 hrs**                                **Full Marks : 70**

*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. Choose the correct alternative for the following:         **10 × 1 = 10**

   (i) _____ states that only valid data will be written to the database.
   (a) Consistency                          (b) Atomicity
   (c) Durability                           (d) Isolation.

   (ii) Cartesian product in relational algebra is
   (a) a Unary operator                     (b) a Binary operator
   (c) a Ternary operator                   (d) not defined.

   (iii) The database schema is written in
   (a) HLL                                  (b) DML
   (c) DDL                                  (d) DCL.

   (iv) A functional dependency A → B is trivial if
   (a) A is a subset of B                   (b) B is a subset of A
   (c) A is a subset of B and B is a subset of A   (d) none of the above.

   (v) A binary tree whose every node has either zero or two children is called
   (a) complete binary tree                 (b) binary search tree
   (c) extended binary tree                 (d) none of above.

   (vi) The postfix equivalent of the prefix * + a b − c d is
   (a) a b + c d − *                        (b) a b c d + − *
   (c) a b + c d * −                        (d) a b + − c d *.

   (vii) In linear search algorithm the Worst case occurs when the item is
   (a) somewhere in the middle of the array
   (b) not in the array at all
   (c) the last element in the array
   (d) the last element in the array or is not there at all.

(viii) Total number of nodes at the $n^{th}$ level of a binary tree can be given as
    (a) 2n         (b) 2n-1         (c) 2n+1         (d) 2n.

(ix) Which of the following statement is false?
    (a) Arrays are dense lists and static data structure
    (b) Data elements in linked list need not be stored in adjacent space in memory
    (c) Pointers store the next data element of a list
    (d) Linked lists are collection of the nodes that contain information part and next pointer.

(x) SQL is a Non procedural language because
    (a) all commands are like verbs in English
    (b) it is not cryptic like C or other low level language
    (c) user describes the information desired without giving a specific procedure
    (d) none of the above options.

## Group – B

2. (a) Write an algorithm to convert an infix expression into its equivalent postfix form.
Convert the following infix expression into its equivalent postfix expression (Show all intermediate steps):
             **A*(B-C)/D+E/(F+G*H)**.

(b) Write a function to insert an element at the end of a singly linked list.

(c) What is/are the advantage(s) of a circular queue over a linear queue?
             **(3 + 4) + 3 + 2 = 12**

3. (a) Write an algorithm to evaluate a postfix expression. Using the algorithm, evaluate the following postfix expression (show all intermediate steps):
        **10   7   5 −   10   +   2   /   +**

(b) Write an algorithm to perform delete operation in a queue.

(c) Write an algorithm to delete the nodes from a singly linked list containing negative values.
             **(3 + 2) + 3 + 4 = 12**

## Group – C

4. (a) Perform insertion sort on the given list. Show different iterations.
        **35 55 75 95  85 45 15 65  05  55**
Why is the insertion sort most efficient when the input list is almost in sorted order?

(b) Construct a binary search tree whose nodes in inorder and preorder are given as follows (Show all intermediate steps):
        Inorder :  **D B H E A I F J C G**
        Preorder: **A B D E H C F I J G**

(c) Write a function to implement sequential search on an n element array. State the advantages of Binary Search over Linear Search.
             **(3 + 1) + 5 + 3 = 12**

5. (a) Delete following nodes from the given BST and reconstruct the tree (Show all intermediate steps).
          **27, 45, 20**
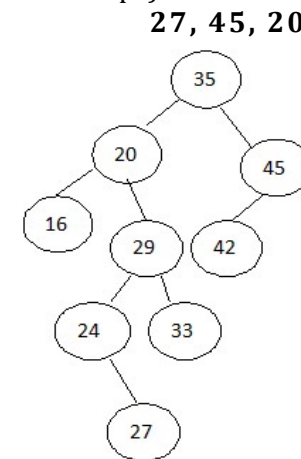


(b) Write a recursive function to find factorial of a given number.

(c) Make a BST for the following sequence of numbers (Show all intermediate trees).
    **45, 32, 90, 34, 68, 72, 15, 24, 30, 66, 11, 50**
             **6 + 3 + 3 = 12**

## Group – D

6. (a) Explain the differences among primary key, candidate key and super key.

(b) What do you understand by referential integrity constraint?

(c) Construct an ER model for student administration system. Students who apply for a course are registered in the system. Short listed candidates are called for interview and their marks are recorded. Selected candidates are admitted.
             **(3 × 2) + 2 + 4 = 12**