

Write the following queries using SQL:

- (i) List all hotel numbers (h-no) and names (h-name) which are located in 'Bangalore' and the hotel name starts with 'P'.
 - (ii) List the names of guests who are going to stay at 'Park Hotel' from 3rd May, 2019 to 10th May, 2019.
 - (iii) Modify the table *Booking* such that the room no (*r-no*) field must always contain some value.
 - (iv) Display the different cities and the number of hotels in each city, sorted in the alphabetical order of the cities.
- (b) Define Candidate key and Alternate key with proper examples.
 $(4 \times 2) + (2 + 2) = 12$

Group - E

8. (a) What are the various anomalies that a relation in a database may have? Explain with proper example(s).
 - (b) Given is a relation R(A,B,C,G,H,I) and the functional dependencies $A \rightarrow B, A \rightarrow C, CG \rightarrow H, B \rightarrow H, CG \rightarrow I$. Find out the candidate key(s) of R. Properly show the steps.
 - (c) Why BCNF is considered a stricter normal form than 3NF?
 $6 + 3 + 3 = 12$
9. (a) What do you understand by cascading rollback? What is cascadeless schedule? Why is it desirable for schedules to be cascadeless?
 - (b) Describe the two-phase locking protocol. What are the drawbacks of this protocol? Is there any other protocol(s) to avoid these drawbacks?
 $(2 + 2 + 1) + (2 + 2 + 3) = 12$

DATA STRUCTURE & DATABASE CONCEPT (CSEN 2206)

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: $10 \times 1 = 10$
 - (i) Let R (A,B,C,D,E,F) be a relation with following functional dependencies: $C \rightarrow F, E \rightarrow A, EC \rightarrow D, A \rightarrow B$. Which of the following is a key for R?
(a) EC (b) AE (c) CD (d) AC.
 - (ii) In ER diagram design, double rectangle is used to denote
(a) multi-valued attribute (b) derived attribute
(c) weak entity (d) strong entity.
 - (iii) If Array's upper bound is specified by 'U' and lower bound is specified by 'L' then the range of the array will be:
(a) $U - L - 1$ (b) $L + U - 1$ (c) $U - L + 1$ (d) $L - U + 1$.
 - (iv) The ____ operation of relational algebra allows us to find tuples that are present in one relation but not in the other.
(a) union (b) intersection (c) projectio (d) set-difference.
 - (v) A Binary Tree of Height h has at most
(a) $2(h+1) - 1$ elements (b) $2^{h+1} + 1$ elements
(c) $2^{h-1} - 1$ elements (d) $2^{h+1} - 1$ elements.
 - (vi) The minimum number of fields with each node of a single linked list is
(a) 1 (b) 2 (c) 3 (d) 4.
 - (vii) Inserting a node after a given node in a doubly linked list requires
(a) one pointer changes (b) two pointer changes
(c) three pointer changes (d) four pointer changes.

- (viii) Which of the following data structures may give overflow error, even though the current n elements in it are less than its size?
 (a) Simple queue (b) Circular queue
 (c) Recursive queue (d) Differential queue.
- (ix) Postfix expression of $(A + B) * C / D$ is
 (a) $A B * C + D /$ (b) $A B C D + * /$
 (c) $A B C * + D /$ (d) $A B + C * D /$.
- (x) How many nodes in a tree can never have an ancestor?
 (a) Any number of nodes (b) All, except leaf nodes
 (c) 0 (d) 1.

Group - B

2. (a) Construct the following Circular Queue of characters. The Circular Queue is implemented using array which is allocated six memory cells. Currently the content of the Queue is as follows:
 FRONT = 2 REAR = 4 QUEUE: , 1, 3, 4, ,
 Describe the Queue (along with FRONT, REAR values) as the following operations take place:
 (i) 5 is added to the Queue.
 (ii) Two elements are deleted from the Queue.
 (iii) 6, 7, 8 are added to the Queue.
 (iv) Two elements are deleted from the Queue.
 (v) 9 is added to the Queue.
 (vi) One element is deleted from the Queue.
- (b) Write an algorithm to evaluate a postfix expression using stack. Using the above algorithm evaluate the following postfix expression:
 $5\ 6\ 2\ +\ *\ 1\ 2\ 4\ /\ -$
3. (a) Convert the following infix expression into postfix expression using stack:
 $A + (B * C - (D / E \wedge F) * G) * H$.
- (b) Define a recursive procedure. Write a recursive algorithm or function in C to find GCD (Greatest Common Divisor) of two integers.
- (c) Five items A, B, C, D and E are pushed in a stack, one after the other starting from A. The stack is popped four times and each element is inserted in a queue. Then two elements are deleted from the queue and pushed back on the stack. Now one item is popped from the

stack. Show all the intermediate steps and find out which item will be popped.

$$5 + (1 + 4) + 2 = 12$$

Group - C

4. (a) Construct the binary tree for the following sequence of nodes in Preorder and Inorder respectively.
 Preorder : G, B, Q, A, C, K, F, P, D, E, R, H
 Inorder: Q, B, K, C, F, A, G, P, E, D, H, R
- (b) When does an AVL tree need to be rotated? Explain right and left rotations with the help of examples.
5. (a) Write the quick sort algorithm.
- (b) Write one difference between linear search and binary search. Write the binary search algorithm.

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

$$6 + (1 + 5) = 12$$

Group - D

6. (a) Explain clearly the difference between physical data independence and logical data independence.
- (b) Using proper ER diagram examples, explain the following terms:
 (i) Simple vs. Composite attribute
 (ii) One-to-many vs. Many-to-many cardinality
 (iii) Total participation vs. Partial participation.
- (c) What is a DBA? What roles does the DBA play in database management?
7. (a) Consider the following given tables:
 Hotel (h-no, h_name, city)
 Room(r-no, h-no, type, price)
 Booking(h-no, g-no, date_from, date_to, r-no)
 Guest (g-no, g-name, address)
 where the underlined attributes are the primary keys.

$$3 + (3 \times 2) + 3 = 12$$