DATA STRUCTURE & DATABASE CONCEPT
(ELEC 3104)

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)   Average case complexity to search an element in Linear Search Tree with 'n' nodes is
         (a) $O(n)$ (b) $O(\log(n))$
         (c) $O(n^2)$ (d) $O(\log(n^2))$.

   (ii)   What is the average case time complexity of Bubble sort?
         (a) $O(n)$ (b) $O(\log(n))$
         (c) $O(n^2)$ (d) $O(n\log(n))$.

   (iii)   Which one of the below mentioned is linear data structure –
         (a) Linked List   (b) Stack
         (c) Queue   (d) All of the above

   (iv)   Visiting root node after visiting left and right sub-trees is called
         (a) Pre- order Traversal   (b) Post-Order Traversal
         (c) In-Order Traversal   (d) Level ordered Traversal

   (v)   Which of the Sorting algorithm is divide and conquer type?
         (a) Bubble Sort   (b) Quick Sort
         (c) Selection Sort   (d) Radix Sort.

   (vi)   In order to maintain the consistency during transactions, database provides
         (a) Commit   (b) Rollback
         (c) Flashback   (d) Abort.

   (vii)   Third normal form is based on the idea of _____ .
         (a) Functional Dependency   (b) Closure Dependency
         (c) Normal Dependency   (d) Transitive Dependency

(viii)   Which one of the following given statements possibly contains the error?
(a) select * from emp where empid = 10000
(b) select empid from emp where empid = 10006
(c) select empid from emp
(d) select empid where empid = 1009 and Lastname = 'BAIDYA'

(ix)   The____ operation allows the combining of two relations by merging pairs of tuples, one from each relation, into a single tuple.
(a) Select   (b) Join
(c) Union   (d) Intersection.

(x)   The Data Base schema is written in
(a) DDL   (b) DML
(c) HLL   (d) DCL

Group – B

2. (a)   Write the pseudo code of insert *(x)* and delete *()* function for a Linear Queue using linked list. 'x' is the element to be inserted. Linked list has single pointer which points to the head. Explain with figures.

(b)   Write the pseudo code of push *(x)* and pop *()* function for a Stack using linked list. 'x' is the element to be inserted. Linked list has single pointer which points to the head. Explain with figures.

(3 + 3) + (3 + 3) = 12

3. (a)   Consider the following infix expression:
$$(5+10)^2+2^2^3$$
Write the corresponding postfix notation. Explain with figure.

(b)   Evaluate previous postfix expression. Explain with figure.

(c)   Calculate the complexity of the process – "infix to postfix and postfix to evaluation".

6 + 4 + 2 =12

Group – C

4. (a)   Write the algorithm of Quick Sort. Calculate the complexity of the Quick Sort in best case.

(b)   Consider the following unsorted data sequence in the array:
11, 22, 33, 44, 55, 66, 77.
Apply Quick sort on the above data set and sort the sequence. Clearly explain all the steps.

(c)   Compare relative merits and demerits of Quick Sort and Insertion sort.

(4 + 2) + 4 + 2 = 12

5. (a) Construct the Binary Search Tree on the given sequence of data:
180, 100, 40, 300, 250, 70, 10, 150, 400.
What is the height of the tree? Delete the root of the tree and reconstruct the Binary Search Tree.

(b) Do post-order traversal of the above constructed Binary Search Tree (after deletion). Mention all the steps.

(3 + 1 + 4) + 4 = 12

Group – D

6. (a) Consider the following relation:
Employee (Fname, MiddileName, SurName, cust_id, age, Mob_no,Location);
What is candidate key? What could be the candidate keys of above-mentioned relation Employee?

(b) What is primary key? Explain with logic.

(c) What is super key? What could be the super keys (any three) of above-mentioned relation Employee?

(d) What is Foreign key. Explain with an example?

3 + 3 + 3 + 3 = 12

7. (a) Consider the following relation:
Employee (Fname, MiddileName, SurName, **eid**, age, Mob, Dname, dept_id);
Dept (**dno**, dname, total_employee, location);
Find out the name of all employees who are above 35 years and sit in location 'ICT' (use Query Language or Relation Algebra).

(b) Find the records of all employee's name and their associated department who are below 40 years (use Query Language or Relation Algebra).

(c) Explain the following terminologies in DBMS:
(i) Weak entity.
(ii) View.

3 + 3 + (3 + 3) = 12

Group – E

8. (a) Why normalization is required in Database design?

(b) Consider the following Relation (R) and its Functional dependencies.
$R(\theta, \mu, \gamma, \alpha, \beta)$,
$\{\theta, \mu\} \rightarrow \{\alpha\}$,
$\{\theta, \mu\} \rightarrow \{\beta\}$,
$\{\beta\} \rightarrow \{\gamma\}$.
$\{\theta\} \rightarrow \{\gamma\}$.

$\theta, \mu, \gamma, \alpha$ and β are all atomic.
Determine the candidate key(s).
What is the level of normalization in the Relation (R)?
Split the relation R further to Achieve highest level of Normalization (i.e. BCNF).

3 + (3 + 3 + 3) = 12

9. (a) Explain "ACID" properties of DBMS Transaction.

   (b) Consider the following schedule:
   $W_1(x) \rightarrow R_1(x) \rightarrow R_2(Y) \rightarrow W_2(X) \rightarrow R_1(K) \rightarrow W_2(Y) \rightarrow C_1 \rightarrow A_2$
   Explain whether it is recoverable or not recoverable.

   8 + 4 = 12

Department & Section	Submission Link
EE	https://classroom.google.com/c/MjQzMTIyMTIzNjUx/a/MjY5MjM1NDYxNzE3/details