Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (CHE-NEW)/SEM-4/CHE-401/2012

2012

DATA STRUCTURE AND DATABASE CONCEPT

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) If height of a binary tree is h, then the maximum nodes at last level will be

a) 2^{h-1} b) 2^{h+1}

c) 2^{h-1} d) none of these.

ii) A functional dependency ($A \rightarrow B$) is said to be trivial if it is satisfied by

a) $A \subseteq B$ b) $B \subseteq A$

c) $A \subset B$ d) None of these.

iii) Instance can be defined as Data are to be stored and retrieved into and from the database at

a) a particular moment

b) whole time

c) both (a) and (b)

d) none of these.

iv) Domain can be defined as

a) The permitted value of a field

b) The permitted value of a tuple

c) The permitted value of a table

d) none of these .

v) Which mechanism is appropriate for stack

a) LIFO b) FIFO

c) both (a) and (b) d) none of these.

vi) The complexity of Bubble sort is

a) O ($\log_n$) b) O (n^2)

c) O ((n^3) d) O (n).

vii) When overflow condition occurs

a) If memory location is full

b) If memory location is available

c) If memory location is empty.

d) None of these.

viii) Graph is said as

a) Linear data structure

b) Non-linear data structure

c) All of these

d) None of these.

ix) Which one is the procedural language ?

a) Relational Calculus b) Relational Algebra

c) QBE d) None of these.

x) Lattice can be defined as the

a) Overall structure of multiple inheritances

b) Overall methods of inheritance

c) Multiple inheritance

d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Write an algorithm for Binary Search technique.

3. What is Garbage Collection ? What is linear data structure ? Give three examples of linear data structures. $2 + 1\frac{1}{2} + 1\frac{1}{2}$

4. Define Binary Tree. What is leaf node ? What is the relation between height and level of a Binary Tree ? What is Complete Binary Tree ? 2 + 1 + 1 + 1

5. Define Schema. What is Data Abstraction ? Show the different levels of Data Abstraction with appropriate diagram.

1 + 1 + 3

6. What are the advantages by using DBMS rather than File Processing System ?

7. What are the significances of DDL and DML ?

8. What are the different anomalies in Database Design ? Discuss each of them. 2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

9. a) Write an algorithm for push and pop operation in stack.

b) Convert the following expressions in Polish and Reverse Polish Notation.

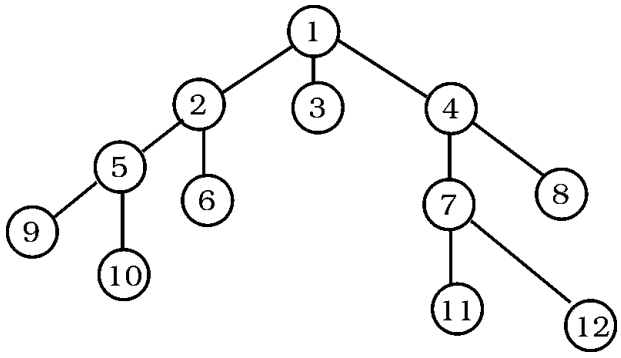
(i) $A + B - C * D * E \wedge F / G * H + I$

(ii) $P * Q \wedge R / L - S / K * T + G * M$

c) Write an algorithm for inserting an element into a single link list. 6 + (3 + 3) + 3

10. a) Write an algorithm for Selection Sort.

b) Traverse the graph using BFS and DFS searching technique. 5 + (5 + 5)



11. a) Consider the following schema :

employee (emp_code, dept_num, emp_name, emp_addr, emp_phone, salary)

department (dept_num, dept_name)

Project (proj_num, emp_num, proj_name)

Write the expressions and SQL query for the following statements using Relational Algebra and SQL respectively :

(i) Find the name of employee who draws the maximum salary and works for a particular department.

(ii) Find how many employees work for a particular project R/D and list all the names.

(iii) Find all the employee names who draw the salary more than Rs. 25,000.

b) Describe three-tier architecture of DBMS.

((3 × 2) × 2) + 3

12. a) What is Normalization ? Why Normalization is needed ?

b) Consider the following relation :

Employee_Code	**Employee_Name**	**Speciality**	**Manager**
A001	E1	HRA	M1
A002	E2	Finance	M2
A003	E3	HRA	M1
A004	E4	IT	M3
A005	E5	IT	M3

Check whether this relation is in 1NF, 2NF, 3NF, BCNF and explain it.

c) Differentiate 3NF and BCNF.

d) Let $R = \{ ABC \}$ and the following functional dependencies holds in F.

$$\{A \rightarrow CD, D \rightarrow BC, E \rightarrow B, B \rightarrow CEG, C \rightarrow GH, G \rightarrow HI, I \rightarrow K\}$$

compute the closure of R^+ of R under F.

((2 + 2) + (1 + 3) + 2 + 5

13. Write short notes on any *three* of the following : 3 × 5

a) Database Administrator and Database Users

b) Specialization and Generalization

c) AVL tree

d) Data Model

e) Memory Allocation.