Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.Tech(CHE)/NEW/SEM-4/CHE-401/2013

2013
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
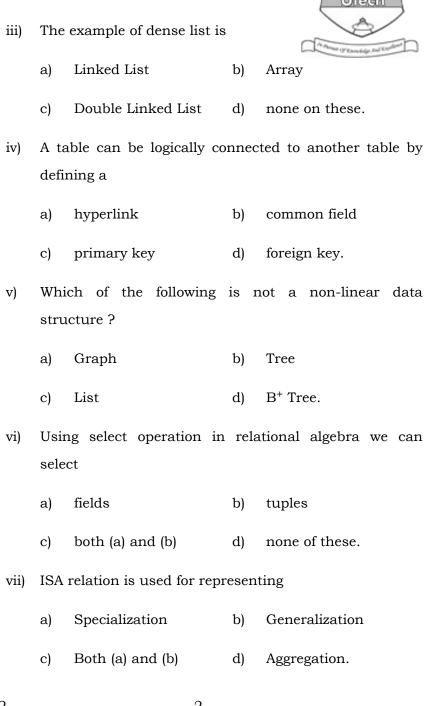## (Multiple Choice Type Questions)

1. Choose the correct alternatives for the following :

$10 \times 1 = 10$

i)   Each cell of a table is said to be

a)   Atomic   b)   Non-atomic

c)   Both (a) and (b)   d)   None of these.

ii) F covers E implies

a)   Every FD in E also in F^+

b)   Every FD of F also in E^+

c)   Both (a) and (b)

d)   None of these.

iii) The example of dense list is

    a)   Linked List   b)   Array

    c)   Double Linked List   d)   none on these.

iv) A table can be logically connected to another table by defining a

    a)   hyperlink   b)   common field

    c)   primary key   d)   foreign key.

v) Which of the following is not a non-linear data structure ?

    a)   Graph   b)   Tree

    c)   List   d) B^+ Tree.

vi) Using select operation in relational algebra we can select

    a)   fields   b)   tuples

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

vii) ISA relation is used for representing

    a)   Specialization   b)   Generalization

    c)   Both (a) and (b)   d)   Aggregation.

viii) Linked Lists are not suitable for implementing

    a) Insertion sort   b) Selection sort

    c) Linear search   d) Binary search.

ix) DML stands for

    a) Data Manipulation Language

    b) Data Manifest Language

    c) Data Matching Language

    d) None of these.

x) Dynamic memory allocation is used

    a) for program efficiency

    b) for space management

    c) for time management

    d) all of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.   3 × 5 = 15

2. Write an algorithm for arranging a collection of unsorted numbers in ascending order using selection sort technique.

3. What is memory allocation ? Explain the different types of memory allocation. What are the different allocation functions ? $2 + 2 + 1$

4. Define adjacency matrix and incidence matrix with suitable example. $2\frac{1}{2} + 2\frac{1}{2}$

5. Differentiate the strong entity set and weak entity set. Explain aggregation with suitable example.

6. What is schema ? Explain different types of schema. What is instance ? $1 + 3 + 1$

7. Define functional dependency. Explain the lossless and lossy decomposition. $2 + 3$

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. a) Write algorithms for inserting an element into queue and deleting an element from queue.

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

   i) A + B*C–D^E/F/G*H + I

   ii) P↑Q^R/L*S/K*T*G^M

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

9. a) Write an algorithm for Quick Sort.

b) Consider the following set of requirements for a university database that is used to keep track of students' transcripts.

i) The university keeps track of each student's name, student number, social security number, current address and phone, permanent address and phone, birth date, sex, class (freshman, sophomore, ..., graduate), major department, minor department (if any), and degree program (B.A., B.S., ..., Ph.D.). Some user applications need to refer to the city, state, and zip code of the student's permanent address and to the student's last name. Both the social security number and student number have unique values for each student.

ii) Each department is described by a name, department code, office number, office phone and college. Both name and code have unique values for each department.

iii) Each course has a course name, description, course number, number of semester hours, level, and offering department. The value of course number is unique for each course.

iv) Each section has an instructor, semester, year, course, and section number. The section number distinguishes sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, ..., up to the number of sections taught during each semester.

v) A grade report has a student, section, letter grade, and numeric grade (0, 1, 2, 3, or 4).

Design an ER diagram for this application. Specify key attributes of each entity type and structural constraints on each relationship type. 6 + 9

10. a) Consider the following schema :

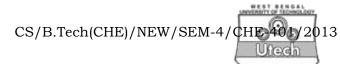employee (emp_code, dept_num, emp_name, emp_addr, emp_phone, salary)

department (dept_num, dept_name, location)

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 average salary, maximum salary, and minimum salary departmentwise.

ii) Find the names of employees assigned to a particular department named 'CHE'.

iii) Find the names of all employees who work in 'CHE' department and earn more salary than any employee in 'FT'.

b) What is view ? What is the procedure to create a view ?

$$[(3 \times 2) \times 2] + (2 + 1)$$

11. a) What is transitive dependency ? Explain with suitable example.

b) What are the different anomalies for designing databases ?

c) Why is BCNF stronger form than 3NF ?

d) Given the following functional dependencies holds in F.

$\{A \rightarrow BD, D \rightarrow C, E \rightarrow I, B \rightarrow EG, G \rightarrow H, I \rightarrow HK, K \rightarrow F\}$

Compute the closure of AB under F.

$$(1 + 2) + 5 + 2 + 5$$

12. a) Define binary tree. Classify binary tree.

b) Discuss BFS with suitable example.

c) "Every tree is graph but every graph is not tree". Explain.

d) Write an algorithm for push operation onto stack.

$$(2 + 2) + 6 + 2 + 3$$

13. Write short notes on any three of the following : $\qquad 3 \times 5$

a) Data Independence

b) Database User and Administrator

c) Sequential Search Technique

d) Circular Queue

e) Recursion.