Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA/SEM-2/MCA-204/2011

2011
DATABASE MANAGEMENT SYSTEM - I

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) The primary key indexing techniques do not allow

a) Duplicate data

b) Multiple attributes

c) Sets of relations

d) Many to many relation.

ii) The column of a table is referred to as

a) Tuple b) Attribute

c) Entity d) Degree.

iii) Relations produced from an E-R model will always be in

a) 1 NF b) 2 NF

c) 3 NF d) Cannot be said.

iv) What is the cardinality of a table with n rows & k columns ?

a) k b) n

c) $n \times k$ d) none of these.

v) The maximum height of a B+ tree of order n with k key values is

a) $(n + k)/2$

b) $\log nk$

c) $\log n / 2 (k/2 + 1)$

d) $\log k / 2n$.

vi) The operation of a certain relation X, produces Y such that Y contains only selected attributes of X. Such an operation is

a) Projection

b) Selection

c) Union

d) Difference.

vii) R = (J. K. L)

F = { JK → L

L → K }

The candidate key(s) is are

a) J and K d) JK

c) Only J d) JK and JL.

viii) Which is another name for weak entity ?

a) Child b) Owner

c) Dominant d) all of these.

ix) Which one of the following is the example of Dynamic Hashing ?

a) Open Address Hashing

b) Chain Hashing

c) Linear Hashing

d) all of these.

x) Given relations R (w, x) and S (y, z). The result of

SELECT DISTINCT w, x

FROM R, S

is guaranteed to be same as R, if

a) R has no duplicate and S is non-empty.

b) R is non-empty and S has no duplicate.

c) Both R and S have no duplicates.

d) R and S have same number of tuples.

GROUP – B

(Short Answer Type Questions)

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

2. Find the minimum cover of F = { A $\rightarrow$ BC ; AC $\rightarrow$ D ; D $\rightarrow$ B; AB $\rightarrow$ D } 5

3. Explam the following with respect to a single example :

   (i) Super Key (ii) Candidate Key (iii) Primary Key

   (iv) Foreigh key (v) Alternate Key.

4. What is a view ? "View does not take any memory space". Justify. How do you create an insertable and updatable view ? 1 + 2 + 2

5. Explain the three schema architecture.

6. Explain the query optimization technique with a suitable example.

GROUP – C

(Long Answer Type Questions)

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

7. a) Consider a university database for the scheduling of classrooms for final exams. This database could be modelled as the single entity set exam with attributes course–name, section–number, room–number and time.

Alternatively. one or more additional entity sets could be defined along with relationship sets to replace some of the attributes of the exam entity set as

i) course with attributes name, department and c-number

ii) section with attributes s-number and enrol-ment and dependent as a week entity set on course.

iii) room with attributes r–number. capacity and building.

Draw an E-R diagram for the above problem.

Reduce the E-R diagram into relational schema by defining all the constraints and assumptions.

b) Explain with example the concept of reducing to relational schema in case specialization and generalization. 10 + 5

8. Answer as directed for the following :

Hotel (Hno, Name, Address) Room (Rno, Rtype, Hno, Price)

Booking (Hno, Gno, Rno, DC from, DC to)

Guest (Gno, GName, GAddress)

a) Find the names of all guests who are staying in hotels either in Kolkata or Chennai. [relational calculus]

b) Find the total number of guests in Hotel Taj. [Tuple Relational Calculus]

c) List the number of rooms in each hotel. [Domain Relational Calculus]

d) Find the room with the maximum price. (SQL)

e) Find the hotel with 2nd maximum no. of rooms. (SQL)

3 + 3 + 3 + 2 + 4

9. Outline an algorithm for insertion of a record in a B+ tree. Construct a B+ tree for the following set of key values under the assumption that the number of key values that fit in a note is 3 :

Key values (3, 10, 12, 14, 29, 38, 45, 55, 60, 68). Show the steps involved in the following insertions (use your algorithm)

insert 11 and 30. 5 + 5 + 5

10. Why is normalization necessary ? Compare between BCNF and 3rd Normal form.

Consider the relation R {RN, POR, PI, PN, DATE, MA, MT} and Functional Dependencies :

{ RN $\rightarrow$ POR; PI $\rightarrow$ PN, RN; PI, DATE $\rightarrow$ MA, MT, POR }

To which normal form does this belong ? Decompose the relation so that it can belong to 3NF. Also show that the decomposition is lossless and it preserves dependency.

(2 + 3) + 10

11. Write short notes on any *three* : 3×5

a) Hashing in file organization.

b) Index-Sequential file organization.

c) Multilevel index

d) Three level data abstraction

e) ACID property.