



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 × 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) $R = (J, K, L)$

$F = \{ JK \rightarrow L$

$L \rightarrow K \}$

The candidate key(s) is are

- a) J and K
- b) Only J
- c) J and K
- 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 × 5 = 15

2. Find the minimum cover of $F = \{ A \rightarrow BC ; AC \rightarrow D ; D \rightarrow B ; AB \rightarrow D \}$ 5
3. Explain the following with respect to a single example :
(i) Super Key (ii) Candidate Key (iii) Primary Key
(iv) Foreign 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 × 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 enrolment and dependent as a weak 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 node 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.

$$5 + 5 + 5$$

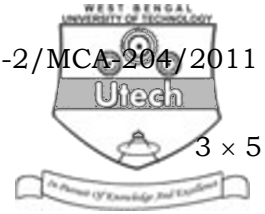
10. Why is normalization necessary ? Compare between BCNF and 3rd Normal form.

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

{ RN → POR; PI → PN, RN; PI, DATE → 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* :

- a) Hashing in file organization.
 - b) Index-Sequential file organization.
 - c) Multilevel index
 - d) Three level data abstraction
 - e) ACID property.
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