

**DATABASE MANAGEMENT SYSTEMS I  
(MCAP 1203)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one 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) Database catalog or dictionary defining descriptive information which is stored in database is called  
(a) constrained Data (b) meta Data  
(c) basic Data (d) filtered Data
- (ii) Concepts of data models that are only useful to computer specialists rather than end users of programs are classified as  
(a) triggered data models (b) logical data models  
(c) conceptual data models (d) physical data models
- (iii) Hierarchical model is also called  
(a) tree structure (b) plex structure  
(c) normalize structure (d) table structure
- (iv) Cartesian product in relational algebra is  
(a) a unary operator (b) a binary operator  
(c) a ternary operator (d) none of these
- (v) Non-leaf nodes of B+ tree structure form  
(a) multilevel clustered indices (b) sparse indices  
(c) multilevel dense indices (d) multilevel sparse indices
- (vi) \_\_\_\_\_ specifies a search condition for a group or an aggregate.  
(a) GROUP BY Clause (b) HAVING Clause  
(c) FROM Clause (d) WHERE Clause
- (vii) Drop Table cannot be used to drop a table referenced by a \_\_\_\_\_ constraint.  
(a) local key (b) primary key  
(c) composite key (d) foreign key

- (viii) The \_\_\_\_\_ operator preserves unmatched rows of the relations being joined.  
(a) inner join (b) outer join  
(c) union (d) union join
- (ix) The basic data type char(n) is a \_\_\_\_\_ length character string and varchar(n) is \_\_\_\_\_ length character.  
(a) fixed, equal (b) equal, variable  
(c) fixed, variable (d) variable, equal
- (x) Tables in second normal form (2NF)  
(a) eliminate all hidden dependencies  
(b) eliminate the possibility of a insertion anomalies  
(c) have a composite key  
(d) have all non key fields depend on the whole primary key.

### Group - B

2. (a) What do you understand by the degree of a relationship? Illustrate with examples.  
(b) Explain total participation of an entity set in a relationship set with example.  
(c) Describe a weak entity set with example.  
(d) Define and explain the concepts of data independence.
- 4 + 2 + 2 + 4 = 12**
3. (a) Consider a university database for the scheduling of classrooms for final exams. This database could be modeled 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
- course with attributes *name*, *department*, and *c-number*
  - section with attributes *s-number* and *enrolment*. section is dependent as a weak entity set on course
  - room with attributes *r-number*, *capacity*, and *building*
- Show an E-R diagram illustrating the use of all three additional entity sets listed.
- (b) Differentiate between strong and weak entity sets. Why sometimes weak entity-sets are needed in database design?

**8 + 4 = 12**

### Group - C

4. (a) Consider a relation R=(A, B,C, D, E, F, G, H, I, J) with the following set of functional dependencies F={AB→C, A→DE, B→F, F→GH, D→IJ}  
Find the candidate key for R. Decompose R into 3NF.
- (b) Let R=(A, B, C, D, E) be a relation with the following set of dependencies F={A→BC, B→CD, E→A, C→ED}. Find the closure of {A,B} or {AB}<sup>+</sup>

**(4 + 5) + 3 = 12**

5. (a) Consider a relation  $R=(A, B, C, D)$  with the following set of functional dependencies  $F=\{A\rightarrow B, B\rightarrow C, C\rightarrow D, D\rightarrow A\}$ .  $R$  is decomposed into  $R_1(AB)$ ,  $R_2(BC)$  and  $R_3(CD)$ . Check whether the decomposition is preserving dependency or not.
- (b) Consider a relation  $R$  with attributes  $A, B, C, D$  and  $E$ , with the following set of functional dependencies  $F$  as:  
 $F=\{A\rightarrow B, A\rightarrow C, CD\rightarrow E, B\rightarrow D, E\rightarrow A\}$   
Check whether the following functional dependencies are implied by the above set or not.  
(i)  $CD\rightarrow AC$       (ii)  $BD\rightarrow CD$       (iii)  $BC\rightarrow CD$ .

**6 + 6 = 12**

### **Group - D**

6. Consider the **SBR** relations below with candidate key underlined:  
Sailors (Sid: integer, Sname: String, Rating: integer, Age: real)  
Boats (Bid: integer, Bname: String, Color: String)  
Reserves (Sid: integer, Bid: integer, day: Date)
- (a) Find the Relational Algebra of the following query using above **SBR** relations.  
(i) Find the names of sailors who have reserved boat 103.  
(ii) Find the names of sailors who have reserved a red or a green boat.  
(iii) Find the names of sailors who have reserved at least one boat.
- (b) Find the Tuple Relational Calculus of the following query using above **SBR** relations.  
(i) Find the sailor name, boat id, and reservation date for each reservation.  
(ii) Find the names of sailors who have reserved a red boat.  
(iii) Find the names of sailors who have reserved at least two boats.

**(3 × 2) + (3 × 2) = 12**

7. (a) Consider the following database schema:  
Hotel (Hno, Name, Address)  
Room (Rno, Rtype, Hno, Price )  
Booking (Hno, Gno, Rno, Dt\_from, Dt\_to)  
Guest (Gno, GName, GAddress)  
Write the following queries in SQL:  
(i) Find the names of all guests who are staying in hotels either in Kolkata or in Chennai.  
(ii) Find the total number of guest in 'Hotel Taj'.  
(iii) List the number of rooms in each hotel.  
(iv) Find the hotel name with the most expensive room.  
(v) Find the hotel with 2nd maximum no. of rooms.

- (b) Discuss about inner join with example.

**(2 × 5) + 2 = 12**

**Group - E**

8. (a) Consider the relational database given below, where the primary keys are underlined.

Faculty(Fno, fname, date\_of\_birth, dept\_no)

Department(dept\_no, dname, building\_no)

Course(Cno, cname)

Teaches(Fno, Cno)

Write the following queries in SQL:

(i) Find the names of the faculty members who work in the same building as faculty member '104' works.

(ii) Find the names of faculty members who are teaching at least one course which faculty member '101' is not teaching.

(b) What is a view? What are its advantages?

(c) What is the difference between sequential and indexed file organization?

**(3 + 3) + 2 + 4 = 12**

9. (a) What is the difference between Primary Index and Multi Level Index? Explain with example.

(b) 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:

(1, 4, 7, 10, 17, 21, 31, 25, 19, 20, 28, 42)

**5 + 7 = 12**

Department & Section	Submission Link
MCA	<a href="https://classroom.google.com/c/MzcxNzUxOTE1ODkx/a/Mzc0ODExNDkwOTUw/details">https://classroom.google.com/c/MzcxNzUxOTE1ODkx/a/Mzc0ODExNDkwOTUw/details</a>