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 following relational schema with underlined candidate keys:
Person(PersonID, Name, Sex, CityOfBirth)
Parent(ParentID, ChildID)
ParentID is a foreign key referring to Person (PersonID) and ChildID is another foreign key referring to Person (PersonID).

(b) Write the following queries in SQL:
i) Find the names of grandparents of all the people who were born in 'Kolkata'.
ii) Find the names of all people who were born in the same city as their father.

(c) Is it possible in general to have two primary indices on the same relation for different search keys? Explain your answer.

(4 + 4) + 4 = 12

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

(b) Construct a B+-tree for the following set of values with number of key is 4.
(1, 3, 8, 11, 16, 22, 30, 24, 18, 21, 27, 43)

5 + 7 = 12

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) Consider a relation R with five attributes A, B, C, D and E. The following dependencies are given
A→ B, BC→E, and ED→ A. The keys for R are
(a) CDE (b) ACD (c) BCD (d) all of these.

(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) Index which has an entry for some of key value is classified as
(a) linear index (b) dense index
(c) non dense index (d) cluster index.

(iv) Which of the following language is used to specify database schema?
(a) Data Management Language
(b) Data Definition Language
(c) Data Development Language
(d) Data Manipulation Language.

(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 joine
(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) The normal form that is not necessarily dependency preserving is
(a) 2NF (b) 3NF (c) BCNF (d) 4NF.

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) Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):

- The NHL has many teams.
- Each team has a name, a city, a coach, a captain, and a set of players.
- Each player belongs to only one team.
- Each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records.
- A team captain is also a player.
- A game is played between two teams (referred to as host-team and guest-team) and has a date (such as May 11th, 1999) and a score (such as 4 to 2).

Construct a clean and concise ER diagram for the NHL database.

(b) What is the difference between a database schema and a database instance? Which of them is liable to be changed frequently and why?

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 $\{AB\}^+$.

(4 + 5) + 3 = 12

5. (a) Consider a relation R=(A, B, C, D, E) with the following set of functional dependencies F={A → C, AC → D, E → AD, E → H}
List all the candidate keys.

(b) What is functional dependency? Why are certain dependencies referred as trivial functional dependencies?

(c) Consider a relation R (A, B, C, D, E, F) with the set of functional dependencies F = {A → B, C → DE, AC → F}. R is decomposed into D = {R_1 (BE), R_2 (ACDEF)}.Find whether D is Lossless or Lossy?

6 + (1 + 1) + 4 = 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.
Find the names of sailors who have reserved boat 103.
(i) Find the names of sailors who have reserved a red or a green boat.
(ii) 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