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) Collection of known and useful raw facts that has some meaning and can be processed in useful way is classified as
(a) management oriented facts (b) updated facts
(c) data (d) recorded facts

(ii) Form of data model which focuses on concepts in same way as data stored in computer system is classified as
(a) low level data models (b) high level data models
(c) dynamic data models (d) medium level data models

(iii) In E-R diagram generalization is represented by
(a) Ellipse (b) Dashed ellipse
(c) Rectangle (d) Triangle

(iv) 'AS' clause is used in SQL for
(a) Selection operation (b) Rename operation
(c) Join operation (d) Projection operation

(v) 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

(vi) 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

(vii) Data Dictionary is also called as _____.
(a) Symbol Table (b) System Catalog
(c) Hash Table (d) None of these

(viii) Which of the following relational algebra operations do not require the participating tables to be union-compatible?
(a) Union (b) Intersection
(c) Difference (d) Join

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

(x) 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.

Group – B

2. (a) Construct an ER Diagram for a Company having following details :
- Company organized into departments. Each department has unique name and a particular employee who manages the department. Start date for the manager is recorded. Department may have several locations.
- A department controls a number of projects. Projects have a unique name, number and a single location.
- Company's employee name, employee no, address, salary, sex and birth date are recorded. An employee is assigned to one department, but may work for several projects (not necessarily controlled by his/her dept). Number of hours/week an employee works on each project is recorded; the immediate supervisor for the employee is also recorded.
- Employee's dependent are tracked for health insurance purposes (dependent name, birth date, relationship to employee are recorded).

(b) Explain the following concepts with an example of each: unary relationship and weak entity.

8 + 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 with two sets of FDs defined as:
F={A → C, AC → D, E → AD, E → H}
G={A → CD, E → AH}
Check whether two sets F and G are equivalent or not.

(b) Given a relation R(ABCDEF) with the following FDs
{AB → C, C → D, D → E, F → B, E → F}
Identify the prime attributes and non prime attributes of R.

6 + 6 = 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.
(i) Find the names of sailors who have reserved at least two boats.
(ii) Find the name of sailors with age over 20 who have not reserved a red boat.
(iii) Find the names of sailors who have reserved all boats.

(b) Find the Domain Relational Calculus of the following query using above **SBR** relations.
(i) Find sailors who have reserved all red boats.
(ii) Find the names of sailors who have reserved boat 103.
(iii) Find the names of sailors who have reserved a red boat.

(3 × 2) + (3 × 2) = 12

7. (a) Consider the following relational schema:
Employee(Employee-name, Street, City)
Works(Employee-name, Company-name, Salary)
Company(Company-name, City)
Manages(Employee-name, Manager-name)

Give an expression in SQL for each of the following queries:

(i) Find the names of all employees in the database who live in the same cities and on the same streets as do their managers.

(ii) Find the names of all employees in the database who do not work for 'PNB'. (Assume that all people work for exactly one company).

(iii) Find the name of the company that has the highest payroll.

(b) What is Outer Join? Explain about Left Outer Join and Right Outer Join with syntax and example.

(3 × 2) + 6 = 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).

Write the following queries in SQL:

(i) Find the names of grandparents of all the people who were born in 'Malda'.

(ii) Find the names of all people who were born in the same city as their father.

(b) Write the difference between commit and rollback with suitable example.

(4 + 4) + 4 = 12

9. (a) What is the difference between Sequential and indexed file organization?

(b) Construct a B+-tree for the following set of values with number of key is 5.
(2, 4, 9, 12, 17, 23, 31, 25, 19, 22, 28, 44).

5 + 7 = 12

Department & Section	Submission Link
MCA	https://classroom.google.com/c/MzcxODg2NTI4MDc3/a/Mzc0ODExMzY2NzY4/details