

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
**(MID SEMESTER EXAMINATION MO/2024)**

**CLASS: BTECH**  
**BRANCH: AIML**

**SEMESTER : V**  
**SESSION : MO/2024**

**SUBJECT: CS237 DATABASE MANAGEMENT SYSTEM**

**TIME: 02 Hours**

**FULL MARKS: 25**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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|--------|--|-----|-----|
| Q.1(a) | Explain the role of abstraction in designing the database for an enterprise.   | [2] | 1 1 |
| Q.1(b) | Consider the following schema for a retail database:<br><br>Customer(cust_id, cust_name, city)<br>Order(order_id, order_date, cust_id, total_amount)<br>Product(prod_id, prod_name, price)<br>OrderDetails(order_id, prod_id, quantity)<br><br>(a) Write a query to find the customer who has placed the highest total orders (total_amount) in 2023.<br>(b) Write a query to display the product with the highest total quantity sold, along with its total sales value.  | [3] | 2 3 |
| Q.2(a) | Explain the different ways in which different types of users interact with a database management system.   | [2] | 1 1 |
| Q.2(b) | <ul style="list-style-type: none"><li>• Entities: "Employee" with attributes emp_id, name, position, and "Department" with attributes dept_id, dept_name.</li><li>• Relationships: "WorksIn" between Employee and Department with attributes start_date, role.</li><li>• Entity: "Project" with attributes project_id, project_name and relationship "Manages" between Employee and Project. Each project has one manager, but an employee can manage multiple projects.</li></ul> Write SQL DDL statements to create the corresponding tables and suggest the integrity constraints that should be maintained.  | [3] | 2 3 |
| Q.3(a) | What does the cardinality represent in an ER diagram?  | [2] | 1 1 |
| Q.3(b) | In a hospital database, "Employee" can be generalized into "Doctor" and "Nurse." Both doctors and nurses share common attributes such as emp_id, name, and salary, but have specialized attributes like specialization for doctors and shift_timings for nurses. Additionally, a "Doctor" can have specializations such as "Surgeon" or "Physician". Each doctor can perform procedures that are part of a treatment plan, which can be represented by aggregation. Design an ER diagram using generalization/specialization and aggregation to model the above scenario.  | [3] | 1 4 |
| Q.4(a) | Draw the Entity-Relationship Diagram (ERD) representing the database for the Indian Premier League (IPL) that efficiently manages, and stores data related to teams, players, matches, coaches, sponsors, owners, and stadiums. Your database should support the following functionalities:<br><b>Player Data:</b> Each player has a unique ID and details like name, age, nationality, handedness, and playing role (batsman, bowler, all-rounder, etc.). Players can only belong to one team at a time but may switch teams between seasons.<br><b>Team Information:</b> Store details about each team including coaches, sponsors, owner, captain, and individual player details (including their prices for the season). | [2] | 1 4 |

**PTO**

**Match Records:** For each match, maintain records of the teams involved, location, date, match type (league, semi-final, final), umpires, man of the match, and detailed statistics (runs, wickets, etc.) for individual players.

**Seasonal Information:** Capture data for each IPL season, including the list of teams, winning team, runners-up, man of the series, and sponsor details.

**Stadium Details:** Record stadium information such as city, country, audience capacity, and pitch conditions.

**Performance Tracking:** For each player, keep track of total runs, wickets, catches, and strike rate, updated after every season.

**Sponsors and Owners:** Store details about sponsors and owners, including their name, field of work, team association, and year of involvement.

- Q.4(b) For the Database designed in Q4(a), solve the following SQL queries: [3] 2 3
- Calculate the average runs scored per match by a specific player over all seasons.
  - Find the player who has received the "Man of the Match" award the most number of times in IPL finals.

- Q.5(a) Consider the following tables: [2] 1 3

**Patients Table**

Patient ID	Patient Name	Sex	Age	MedInsuranceNo	AadharNo
01	Sheela	F	23	Med0291	839292319012
02	Rehan	M	21	Med8421	123456789012
03	Anay	M	56	Med4203	848298469201
04	Mahira	F	42	Med4792	724723021922
05	Nishant	M	12	Med8419	472038311099

**Checkup Details Table**

Patient ID	AnnualCheckupMonth	Fees
03	Feb2022	6700
04	Apr2022	8900
03	Feb2022	6700
04	Apr2022	8900

Suggest the Super Keys, Candidate Keys, and the Primary Key for both tables.

- Q.5(b) Given the schema: [3] 2 3

Employee(emp\_id, emp\_name, dept\_id, salary)

Department(dept\_id, dept\_name)

Project(proj\_id, proj\_name, dept\_id)

WorksOn(emp\_id, proj\_id)

(a) Write a relational algebra expression to find employees who work on all the projects managed by their department.

(b) Write a relational algebra expression to find employees who work on at least one project but do not work in the same department that manages the project.