| Name of the Course                        | : | B.Sc. Prog./Mathematical Sc |  |
|---|---|-----------------------------|--|
| Semester                                  | : | II                          |  |
| Name of the paper                         | : | Database Management Systems |  |
| Unique Paper Code                         | : | 42341202                    |  |
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| The medium for setting the question paper | : | English                     |  |

Duration: 2 Hours

Maximum Marks: 75

NOTE: Attempt any four questions. All Questions carry equal marks

Q1. Illustrate with the help of an example that how an Extended Entity-Relationship (EER) diagram containing specialization can be converted to tables. Next, consider the following set of requirements for a university database:

A university has many departments; each department has multiple instructors; one among them is the head of the department, an instructor belongs to only one department; each department offers multiple courses; each of which is taught by a single instructor; a student may enroll for many courses offered by different departments.

For the given descriptive case study, draw the Entity-Relationship(ER) Diagram. The ER diagram should depict the ER constructs including all the strong entities and is there a weak entity type then give its name, partial key, and identifying relationships with associated attributes, a composite attribute, a multi-valued attribute, derived attribute, cardinality ratios, and total/partial participation constraint. Justify your choices.

## Q2. STUDENT (<u>S ID</u>, S\_NAME, S\_DOB, S\_CITY, S\_MARKS) COURSE (<u>C ID</u>, C\_NAME, S\_ID)

For the above-given relational schema write the **Create Table commands** in SQL. You must ensure that you make use of **INTEGER** and **STRING DATA TYPES**, **PRIMARY KEY**, and **FOREIGN KEY CONSTRAINTS** at least once. Give one **insert command** for each of the above relations.

Also, write the following five queries in SQL based on the above relational schema:

- add a new column 'C\_LOC' in the relation COURSE .
- retrieve names of all students who belong to 'DELHI'.
- update the **S\_NAME** to 'Krishore' where **S\_ID** is '2'.
- find the highest and lowest marks of **Students**.
- retrieve all Course information for courses with a C\_NAME that starts with 'T'.

- Q3. What is a partial dependency? With what Normal Form is it associated? Give an example. Also consider the relational schema R (A, B, C, D, E) with the following set of Functional Dependencies: F= {A→BC, CD→E, B→D, E→A}. Obtain the candidate keys for R? Decompose R into 2NF and 3NF relations.
- Q4. What additional information is conveyed by a schema diagram as compared to the **Entity-Relationship (ER)** Diagram?

Also, Map the below-given ER diagram into a relation schema. Show all the steps and justify the decisions taken at each step. For example, give the reasons for choosing the primary key attributes, why any relationship is modelled using a relation. Specify the foreign keys for this schema, stating any assumptions you make.



Q5. What is the role of the Data Dictionary in Database Management System (DBMS)? How does this feature make the DBMS independent of the underlying database? Also, consider the following table instance:

| E_id | E_name | E_phone    | D_no | D_name  |
|------|--------|------------|------|---------|
| 1    | RAMESH | 9999334455 | 1    | HR      |
| 2    | RAJ    | 8888776655 | 2    | Admin   |
| 3    | SAMAR  | 8899777700 | 3    | Account |
| 4    | TIYA   | 7865906666 | 1    | HR      |
| 5    | RIA    | 9887545555 | 2    | Admin   |

Illustrate Insertion, Deletion, and Modification anomalies in the given relation by giving suitable examples and do the needful to remove Insertion, Deletion, and Modification anomalies from the relational schema.

Q6. What are Entity integrity and Referential integrity

constraints? Why each is considered important?

Also, consider the following schema *COMPANY* to answer the given questions:

PROJECT (Pnmuber, Pname, Manager-number) EMPLOYEE (Empno, Empname, hiredate) ASSIGNED (Pnumber, Empnumber, Hours)

Give one example of the violation of entity integrity constraint while insertion in **PROJECT** table and one example of an insertion in the **ASSIGNED** table, that violates referential integrity constraint. Assume appropriate database instances to answer this part of the question.

Also, write the following queries in Relation Algebra:

- get the details of the employees working on both projects 'P2' and 'P3'. •
- delete the record of an employee with **Empno** 'E2'. •
- get the names of employees working on project 'P1' but not on 'P2'. •
- list the names of employees who are working on a project whose manager is

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