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|  | The National Institute of Engineering  Department of CS&E / IS&E/ AI&ML |

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| Course: **Database Management Systems** |  | Course Code: **BCS403** |
| Max Marks: 25 | **TEST - 1** | Time:1hr (3:45-4:45pm) |
| **Date: 27-03-2025** |  | Semester: 4 |

Scheme and Solution

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| **Q.No.** | **Questions** | **Marks** | |
| 1 | Define the following:   1. Data model   A data model is a collection of concepts that can be used to describe the structure of a database. By structure of a database - the data types, relationships and constraints that apply to the data. Most data models also include a set of basic operations for specifying retrievals and updates on the database.   1. Conceptual schema   conceptual schema, which describes the structure of the whole database for a community of users. The conceptual schema hides the details of physical storage structures and concentrates on describing entities, data types, relationships, user operations, and constraints.   1. Logical data independence   Logical data independence is the capacity to change the conceptual schema without having  to change external schemas or application programs | 2m X 3 = 06 | |
| 2 | Design an ER diagram for an **Online food delivery system** where customers, restaurants, and delivery personnel are involved. Each customer can place multiple orders, each order is prepared by a restaurant, and a delivery person is assigned to fulfill the order. Mention the entities (Assume minimum 4 entities), relationships, attributes, and key attributes and cardinality ratios in the ER diagram.  Any valid Entities considered [2M]  Related attributes, Key attribute[1M]  Relationship[2M]  Cardinality[1M]  Representation used in the sample as follows (can be mentioned as 1(one) M(many)    **Sample ER diagram for Online food delivery**  A diagram of a flowchart  Description automatically generated | 07 | |
| 3 | Apply your understanding of database constraints to identify and explain which types of constraints might be violated by an Insert operation. Provide a suitable example to illustrate your explanation  INSERT may violate mainly 4 constraints:   * Domain constraint: [1M]   + if one of the attribute values provided for the new tuple is not of the specified attribute domain * Key constraint: [1M]   + if the value of a key attribute in the new tuple already exists in another tuple in the relation * Referential integrity: [1M]   + if a foreign key value in the new tuple references a primary key value that does not exist in the referenced relation * Entity integrity: [1M]   + if the primary key value is null in the new tuple   Examples [2M] | 06 | |
| 4 | Consider the following relational schema:  Faculty (FacID, Name, Dept\_Name, Salary, Experience)  Section (Course\_code, Section\_No, Sem, Year, Room\_No,FacID)  Answer the following queries using relational algebra:  \* The answers to the queries may be split into multiple relations for better clarity and logical representation   1. List the details of faculty who works in Information Science Department.   **σ Dept\_Name=′InformationScience′​ (Faculty)** [1M]   1. Find the names of the faculty who earn more than 30,000 salary in Computer Science department.   **π Name ​(σDept\_Name=′ComputerScience′ ∧ Salary > 30000​ (Faculty)) [1M]**   1. Retrieve the list of all courses taught in the Even 2020 and Odd 2021 semesters.   **π Course\_code​ (σ((Sem % 2 = 0) ∧ Year = 2020) ∨ ((Sem % 2 = 1) ∧ Year = 2021) ​(Section)) [1M]**  ***\*if semester is assumed as odd/even***  **πCourse\_code​ (σ ( ( Sem =‘even’) ∧ Year = 2020) ∨ ( ( Sem = ‘odd’) ∧ Year = 2021) ​(Section)) [1M]**   1. List the Courses offered in even semester 2020 but not in odd semester 2022.   π Course\_code ​(σSem % 2 = 0 ∧ Year = 2020​(Section)) − πCourse\_code​(σSem % 2 = 1 ∧ Year = 2022​(Section)) [1M]  *\*semester may be considered as odd/even*   1. Find the faculty who is having more than 15 years of teaching experience in Mechanical Department.   **σ Dept\_Name = ′Mechanical′ ∧ Experience >15​ (Faculty) [1M]**   1. Retrieve the department names of faculty members who have more than 10 years of experience and are teaching a course in semester 6.   **π Dept\_Name​ (σ Experience >10 ∧ Sem = 6​ (Faculty ⋈ Section)) [1M]**   * above is used the natural join * Even theta join or equi join can be considered | | 06 |