

Sem: Aug – Dec 24		
Maximum Marks: 50	Examination: ETE Exam	Date: 17-01-2025 Duration: 2 hrs
Programme code: 09	Class: FY	Semester/Trimester: I
Programme: MCA		
College: K. J. Somaiya Institute of Management	Name of the department/Section/Center: DST	
Course Code: 317P09C104	Name of the Course: Database Applications	
Instructions: Answer any two from Q1 to Q3. Answer any two from Q4 to Q6.		

Question No.		Max. Marks
Q1	The agriculture sector needs a robust system to effectively manage farms, crops, workers, and associated operations to enhance productivity and decision-making. Each farm, uniquely identified by a Farm ID, contains essential details such as its name, geographical location, total area (measured in acres), and the region it belongs to. This classification aids in regional monitoring and resource allocation. Farms cultivate a variety of crops, where each crop is identified by a Crop ID and includes additional attributes such as name, type (e.g., cereal, vegetable, fruit), and growing season. A crop may be cultivated on multiple farms, and tracking this association provides insights into cultivation patterns. The system also manages information about workers employed on farms. Each worker is uniquely identified by a Worker ID and is assigned to only one farm. Worker details include their name, role (e.g., farmer, technician, manager), date of birth, and joining date. This ensures the efficient allocation of human resources for specific operations. To maintain productivity, farms use pesticides and fertilizers. The system records details of each application, including the type of chemical used, quantity (in litres or kilograms), application date, and the name of the supervisor overseeing the process. This ensures compliance with safety protocols and enhances crop health. Harvesting is a critical operation, and the system captures details such as the harvest date, total yield (in tons), and the workers involved in the harvesting process for each crop. These records provide essential insights into productivity and efficiency. Additionally, farms often rely on machinery for various tasks. Each piece of machinery is uniquely identified by a Machinery ID and includes attributes such as type (e.g., tractor, plow, harvester), brand, purchase date, and operational status (active or inactive). The system also logs the usage of machinery, recording the crop involved, the date of use, and the operator responsible. Design an ER diagram to capture the above requirements. Make sure cardinalities and primary keys are clear.	15 marks
Q2	Convert the ER diagram into a relational database schema. Be certain to indicate primary keys and referential integrity constraints. Write the justification for each relation. <pre> erDiagram Manufacturer --o{ Part : "made-by" Part --o{ Order : "contains" Customer --o{ Order : "order" Manufacturer { string city string address string street string name PK } Part { string description string part-num PK } Customer { string ID PK string name } Order { string order-num PK } </pre>	15 marks

Q3	Consider a waste management-based relational schema with the following tables: FACILITY(Facility_id, facility_name, location, capacity) WASTE_TYPE(waste_id, waste_name, waste_category) COLLECTION(facility_id, waste_id, collection_date, quantity_collected) EMPLOYEE(employee_id, employee_name, facility_id, role) Write the queries in relational algebra to retrieve the data - Find all waste types belonging to the 'Hazardous' category. - Find all employees who work at facilities located in the same location as the facility with ID 'F101'. - Find the total quantity of a particular waste type (e.g., 'Plastic') collected. - Find the details of employees who worked at facilities that handle waste type with ID 'W303'. - Find the details of waste types (waste_id, waste_name, and waste_category) that had a total quantity collected greater than 500 tons.	15 marks
Q4	Consider the following unnormalized relation for a library management system: Book_Borrowing_Details (Borrow_ID, Member_ID, Member_Name, Member_Address, Book_ID, Book_Title, Author_Name, Genre, Borrow_Date, Due_Date, Return_Date, Fine_Amount) Normalize the given relation to 3rd normal form. Describe each stage in detail.	10 marks
Q5	- Describe data abstraction and data independence. - Write note on concurrency in transaction processing and different ways to handle it.	10 marks
Q6	Write notes on: - Weak entity sets and strong entity sets - Database users - Database Security	10 marks