VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.: 25MCA00091

SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS

CONTINUOUS ASSESSMENT TEST - I

FALL SEMESTER 2025-2026

SLOT: B2+TB2

Programme Name & Branch	: MCA
Course Code and Course Name	: PAMCA503 - Database Management Systems
Faculty Name(s)	: Dr. BIMAL KUMAR RAY, Dr. JAYARAM REDDY A
Class Number(s)	: VL2025260106038, VL2025260106043
Date of Examination	: 18-Aug-2025
Exam Duration	: 90 minutes

Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)
  1. Design normalized relational schemas using ER and EER modeling
  2. Apply relational algebra and normalization techniques for schema optimization

Q. No	Question	M	CO	BL
1.	A large e-commerce company is upgrading its data management system to handle millions of transactions daily. As the database architect, you are tasked with explaining to the management team how the different modules of a Database Management System (DBMS) will work together to ensure efficient storage, retrieval, security, and transaction processing. With the help of a neat diagram, describe the major component modules of a DBMS and explain their interactions in the given scenario.	10	1	2
2.	Design a database to keep track of information for an art museum. Assume that the following requirements were collected: ■ The museum has a collection of ART_OBJECTS. Each ART_OBJECT has a unique Id_no, an Artist (if known), a Year (when it was created, if known), a Title, and a Description. The art objects are categorized in several ways, as discussed below. ■ ART_OBJECTS are categorized based on their type. There are three main types: PAINTING, SCULPTURE, and STATUE, plus another type called OTHER to accommodate objects that do not fall into one of the three main types. ■ A PAINTING has a Paint_type (oil, water color, etc.), material on which it is Drawn_on (paper, canvas, wood, etc.), and Style (modern, abstract, etc.). ■ A SCULPTURE or a statue has a Material from which it was created (wood, stone, etc.), Height, Weight, and Style. ■ An art object in the OTHER category has a Type (print, photo, etc.) and Style. ■ ART_OBJECTs are categorized as either PERMANENT_COLLECTION (objects that are owned by the museum) and BORROWED. Information captured about objects in the PERMANENT_COLLECTION includes Date_acquired, Status (on display, on loan, or stored), and Cost. Information captured about BORROWED objects includes the Collection from which it was borrowed, Date_borrowed, and Date_returned.	10	1	3

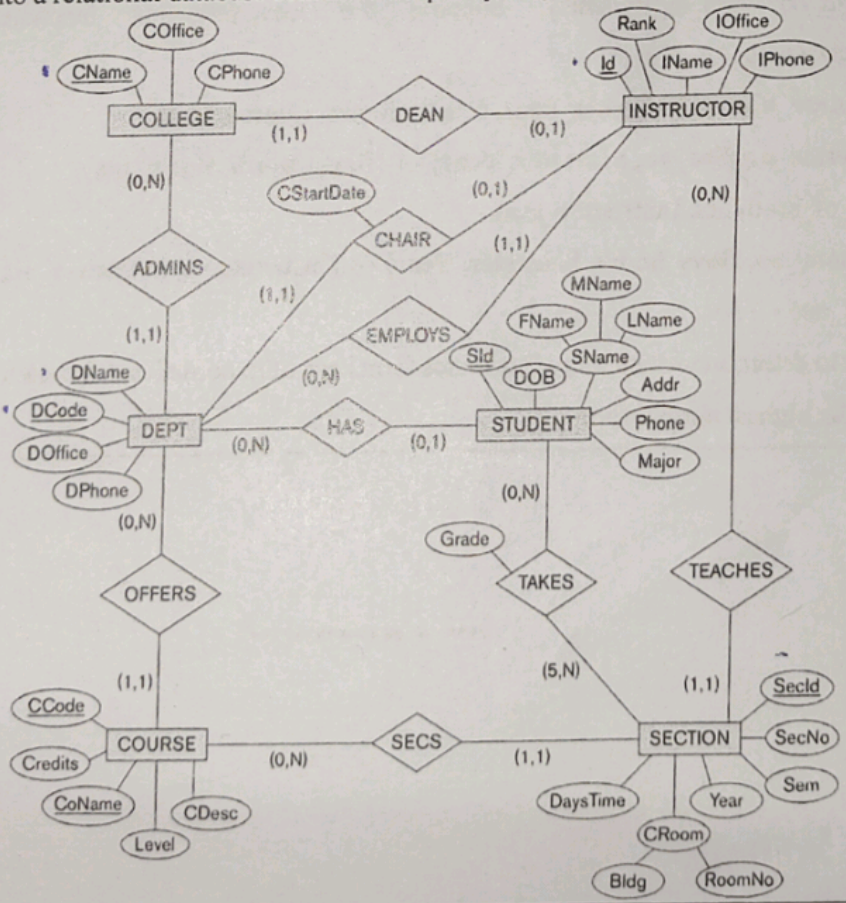
	■ Information describing the country or culture of Origin (Italian, Egyptian, American, Indian, and so forth) and Epoch (Renaissance, Modern, Ancient, and so forth) is captured for each ART_OBJECT. ■ The museum keeps track of ARTIST information, if known: Name, Date_born (if known), Date_died (if not living), Country_of_origin, Epoch, Main_style, and Description. The Name is assumed to be unique. ■ Different EXHIBITIONS occur, each having a Name, Start_date, and End_date. EXHIBITIONS are related to all the art objects that were on display during the exhibition. ■ Information is kept on other COLLECTIONS with which the museum interacts, including Name (unique), Type (museum, personal, etc.), Description, Address, Phone, and current Contact_person. Draw an EER schema diagram for this application. Discuss any assumptions you make, and that justify your EER design choices.			
3.	The figure below shows an ER schema for a UNIVERSITY database that can be used to keep track of courses, sections, student and instructors. Map this schema into a relational database schema and specify all primary keys and foreign keys.  	10	1	3
4.	**Consider the two tables *T1* and *T2* shown BELOW. Show the results of the following operations.**	10	2	3

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	TABLE T1 P Q R 10 a 5 15 b 8 25 a 6 TABLE T2 A B C 10 b 6 25 c 3 10 b 5 **a. T1 ⋈(T1.P = T2.A) T2** **b. T1 ⋈(T1.P = T2.A) T2 -- Left Outer Join** **c. T1 ⋈(T1.Q = T2.B) T2 -- Right Outer Join** **d. T1 ∪ T2** **e. T1 ⋈(T1.P = T2.A AND T1.R = T2.C) T2**			
5.	Consider the relation *R*, which has attributes that hold schedules of courses and sections at a university; *R* = {Course_no, Sec_no, Offering_dept, Credit_hours, Course_level, Instructor_ssn, Semester, Year, Days_hours, Room_no, No_of_students}. Suppose that the following functional dependencies hold on *R*: **{Course_no} → {Offering_dept, Credit_hours, Course_level}** **{Course_no, Sec_no, Semester, Year} → {Days_hours, Room_no, No_of_students, Instructor_ssn}** **{Room_no, Days_hours, Semester, Year} → {Instructor_ssn, Course_no, Sec_no}** Try to determine which sets of attributes form keys of *R*. normalize this relation to the highest normal form	10	2	4

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