REG.NO.: [redacted]

SLOT: A2+TA2

VIT

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

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2026-2027

Programme Name & Branch	: II – YEAR B.tech [BCE,BCB,BAI,BBS,BDS]
Course Code and Course Name	: BACSE202-Database Systems
Faculty Name(s)	: Dr. GOVINDA K,Dr. SARITHA MURALI,Dr.KALAIVANI Dr.KONATHAM,Dr.SUMALATHA,Dr.POOJACHAUDHARY, Dr. LAKSHMI S,Dr. DIVIYA M,Dr. SUDHAKAR K,Dr. ARPITA GHOSH, Dr. SARASWATHI U,Dr. VANI RAJASEKAR,Dr. MANOHAR KUMAR CVSS,Dr. AVISHEK NANDI,Dr. KAVITHA G, Dr. SOMASUNDARAM R, Dr.KATARI ,Dr.BALAKRISHNA, Dr.JOTHIARUNA
Class Number(s)	: VL2026270101647, VL2026270101657, VL2026270103316 VL2026270101659, VL2026270101661, VL2026270101666, VL2026270101669, VL2026270101672, VL2026270101674, VL2026270103002, VL2026270101681, VL2026270101685, VL2026270101689, VL2026270101696, VL2026270101701, VL2026270101705, VL2026270103067
Date of Examination	: 09/08/2026
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)

Course Outcomes:

1. Understand the role of database management systems in organizations and design relational data models and their operations.
5. Apply database design principles to create scalable and maintainable data models for real-world systems.

Q. No	Question	M	CO	BL
1.	Discuss the main characteristics of Database approach and how it is differs from traditional file processing system?	10	1	2
2.	Explain the Relational model proposed by B.C.Codd, list the rules of Codd's for a relational database?	10	1	1

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3.	a) Match the real-world business scenarios in **Column A** with their appropriate data model types in **Column B**. **Column A: Case Study** **i.** A retail bank tracks client accounts by storing transactions in tables that link together through matching account numbers. D **ii.** An online store designs its system by mapping out shoppers, shopping carts, and products as distinct entities and defining the links between them. E **iii.** A corporate computer system organizes its internal file directory structure where files sit inside specific folders, which sit inside a drive. A **iv.** A national power grid manages its electricity routing by mapping out how multiple generating stations link directly to multiple local substations. B **v.** A flight simulation program structures aircraft data by grouping flight statistics and aerodynamic calculations together inside a single software component. C **Column B: Data Model** **A.** Object-Oriented (OOP) Data Model **B.** Hierarchical Data Model **C.** Network Data Model **D.** Relational Data Model **E.** Entity-Relationship (ER) Model	5	5	2
	b) The LogiTrack is a global supply chain enterprise managing shipments across various hubs. The company utilizes a backend relational database structure defined by the following schema: shipment (shipment_id, source_city, destination_city, weight) carrier (carrier_name, fleet_size, vehicle_type) assigned_to (shipment_id, carrier_name, delivery_status) hub_manager (hub_city, manager_emp_id, emergency_contact) Identify the specific relational key and domain constraints and represent the final, structured relational schema.	5		
4.	a) "FlexSpace Inc." operates a smart corporate office hub and needs to map o its database architecture. You are given the following operational design rules: **Parking Slots**: Every executive employee is assigned exactly one designated premium parking space. A parking space cannot be shared or assigned to more than one executive. **Office Desks**: Each major corporate department (e.g., HR, Finance, Engineering) is allocated a dedicated wing containing multiple physical office desks. To avoid boundary overlapping, any given desk can physically belong to only one specific department. **Project Assignments:** The company runs multiple cross-functional projects. An employee can be assigned to work on several projects simultaneously, and each project requires a team of multiple employees to collaborate together. identify the specific Relationship Cardinality Ratio for the given scenario and justify it.	5	5	3

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	b) The PowerGrid Corporate uses a centralized relational database to log monthly electricity consumption for residential consumer and it uses the following database table schema: Electricity_Log(Consumer_ID, Meter_Serial_No, Reading_Date, Units_Consumed, Consumer_Name, Meter_Type) The database engineering team has officially audited the system logs and verified the following operational facts about how variables interact inside the dataset: • Each unique Consumer_ID belongs to exactly one Consumer_Name. • Each unique Meter_Serial_No is explicitly tied to exactly one Meter_Type (e.g., Smart Meter vs. Analog Meter). • To calculate the exact Units_Consumed during a billing cycle, the system requires both the specific Meter_Serial_No and the exact Reading_Date together. based on the above operational rules verified by the engineering team at PowerGrid Corp, construct and list the complete set of all non-trivial Functional Dependencies (FDs).	5		
5.	Draft a complete Entity-Relationship (ER) Diagram for an e-commerce enterprise based on the following business rules: • **Departments:** The company is organized into multiple departments. Each department possesses a unique name, multiple geographical locations, and is managed by a single employee whose managerial start date must be tracked. • **Projects:** Each department controls a set of projects. Every project is identified by a unique name and number and is tied to a single operational location. • **Employees:** The system records each employee's SSN (unique identifier), name, address, salary, gender, and birth date. Every employee is assigned to exactly one department. • **Assignments & Supervision:** Employees can work on multiple projects simultaneously (including projects outside their own department). The database must log the exact number of hours per week an employee dedicates to each project. Additionally, every employee reports to an immediate supervisor within the company. • **Dependents:** To manage health insurance benefits, the system tracks each employee's dependents by recording their name, birth date, gender, and relationship to the employee.	10	5	3

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