VII

Vellore Institute of Technology

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

REG.NO.:

## SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS

CAT-1

FALL SEMESTER 2026-2027

SLOT: B1+TB1

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|---|---|---|
| Programme Name & Branch | : | B.Tech CSE(Cybersecurity &AIDE) |
| Course Code and Course Name | : | BACSE202 Database Systems |
| Faculty Name(s) | : | Ranichandra C, Jayaram Reddy A, Thanga Mariappan L |
| Class Number(s) | : | VL2026270102651, VL2026270102641, VL2026270102655 |
| Date of Examination | : | 10th August 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, 4 – Analyze, 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. Understand the role of database management systems in organizations and design relational data models and their operations.

| Q. No | Question | M | CO | BL |
|---|---|---|---|---|
| 1. | A Database Management System (DBMS) is widely used in various application domains such as education, banking, e-governance, entertainment, and legal services. Consider the following scenarios:<br>a. A second-year B.Tech student develops and maintains the web portal for an International Conference 2026.<br>b. An SBI bank manager analyzes customer transactions to identify suspicious activities related to anti-money laundering (AML).<br>c. A junior lawyer performs electronic filing (e-filing) of legal documents for an upcoming court case using the judicial portal.<br>d. A common citizen books movie tickets using the BookMyShow mobile application.<br>Identify the appropriate category of database user represented in each scenario. Justify your classification by explaining the role, responsibilities, and level of interaction of each user with the database. | 10 | 1 | 2 |
| 2. | With a neat diagram, illustrate the database system environment of a Database Management System (DBMS). Explain the purpose of each major component and analyse how they interact to process user requests efficiently while ensuring data integrity, security, and consistency. | 10 | 1 | 2 |
| 3. | Computer Sciences Department frequent fliers have been complaining to Dane County Airport officials about the poor organization at the airport. As a result, the officials have decided that all information related to the airport should be organized using a DBMS, and you've been hired to design the database. Your first task is to organize the information about all the airplanes that are stationed and maintained at the airport. The relevant information is as follows: Every airplane has a registration number, and each airplane is of a specific model. The airport accommodates a number of airplane models, and each model is identified by a model number (e.g., DC-10) and has a capacity and a weight. A number of technicians work at the airport. You need to store the name, SSN, address, phone number, and salary of each technician. Each technician is an expert on one or more plane model(s), and his or her expertise may overlap with that of other technicians. This information about technicians must also be recorded. Traffic controllers must have an annual medical examination. For each traffic controller, you must store the date of the most recent exam. All airport employees (including technicians) belong to a union. You must store the union membership number of each employee. You can assume that each employee is uniquely identified by the social security number. The airport has a number of tests that are used periodically to ensure that airplanes are still airworthy. Each test has a Federal Aviation Administration (FAA) test number, a name, and a maximum possible score. The FAA requires the airport to keep track of each time that a given airplane is tested by a given technician using a given test. For each testing event, the information needed is the date, the number of hours the technician spent doing the test, and the score that the airplane received on the test. Draw an ER diagram for the airport database. Be sure to indicate the various attributes of each entity and relationship set, and also specify the key and participation constraints for each relationship set. Specify any necessary overlap and covering constraints as well. | 10 | 1 | 5 |

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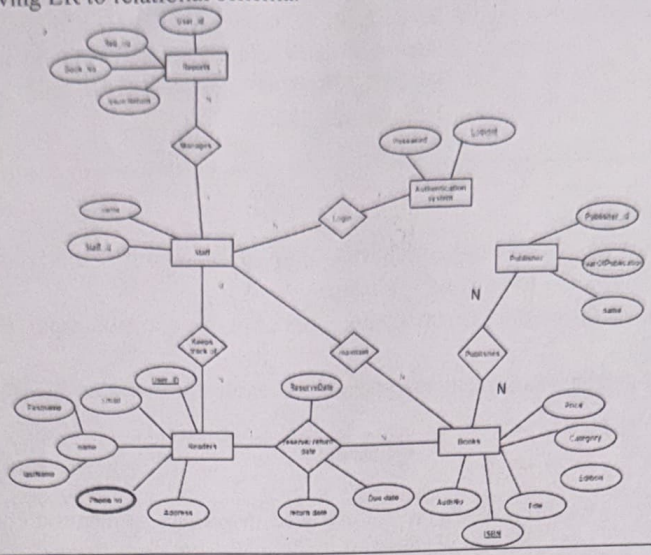
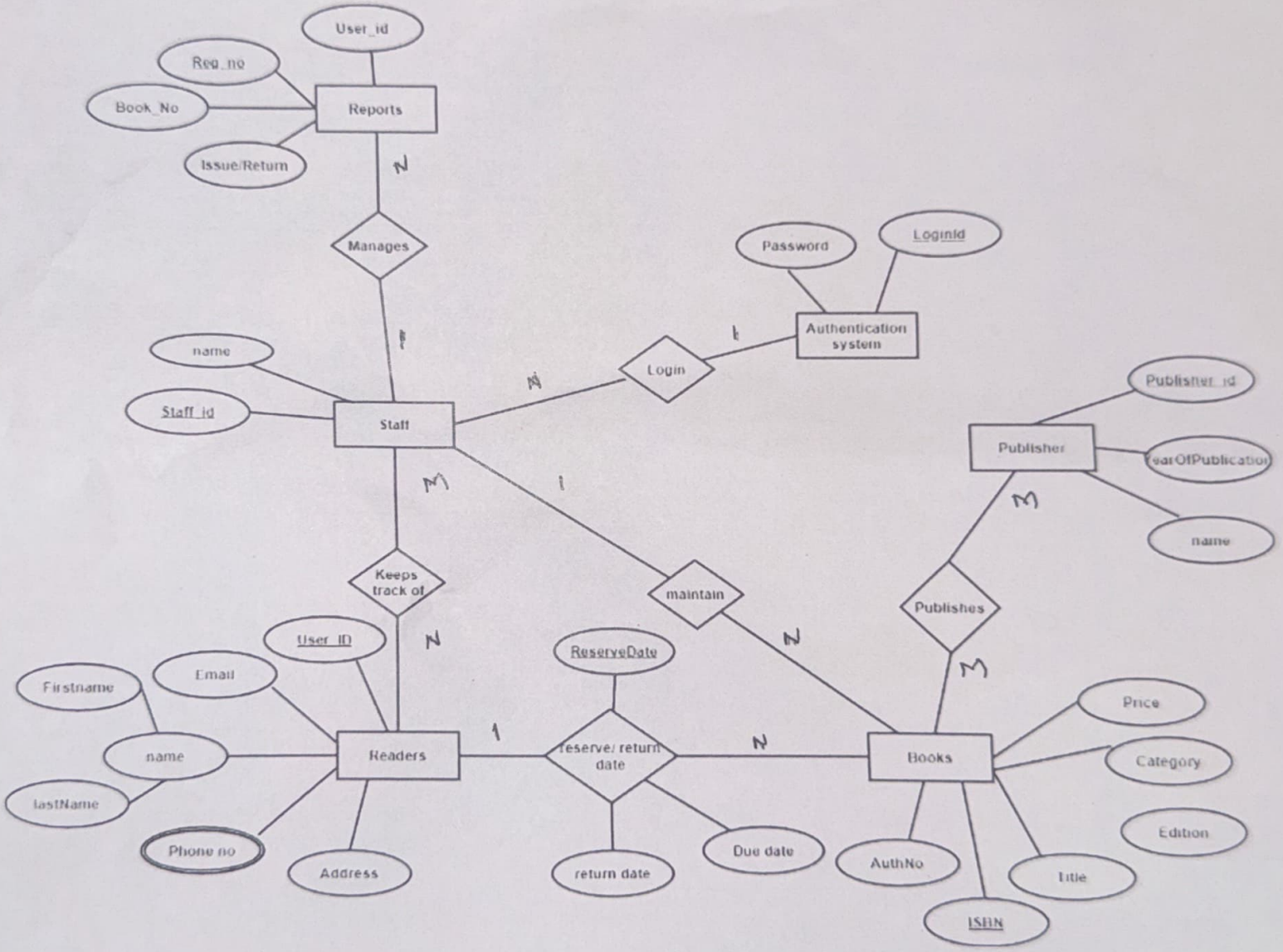
|---|---|---|---|---|
| 4. | Convert the following ER to relational schema.<br>  <br> | 10 | 1 | 3 |
| 5. | **Constraint Violations in an E-Commerce Database**<br>Consider the following tables in an E-Commerce Database.<br>**CUSTOMER**<br>**PRODUCT**<br>**ORDERS**<br>**Assume the following constraints:**<br>**CUSTOMER :** CUSTOMER_ID – Primary Key, EMAIL – Unique, CUSTOMER_NAME – NOT NULL<br>**PRODUCT:** PRODUCT_ID – Primary Key, PRICE > 0 (CHECK Constraint), STOCK ≥ 0 (CHECK Constraint)<br>**ORDERS:** ORDER_ID – Primary Key, CUSTOMER_ID – Foreign Key references CUSTOMER(CUSTOMER_ID), PRODUCT_ID – Foreign Key references PRODUCT(PRODUCT_ID), QUANTITY > 0 (CHECK Constraint)<br>If the following SQL statements are executed independently, identify the constraint violated (if any) and justify your answer.<br>a) INSERT INTO CUSTOMER VALUES ('C1001','Karthik','karthik@gmail.com','Salem');<br>b) INSERT INTO CUSTOMER VALUES ('C1005','Divya','priya@gmail.com','Chennai');<br>c) INSERT INTO CUSTOMER VALUES ('C1006',NULL,'divya@gmail.com','Vellore');<br>d) INSERT INTO PRODUCT VALUES ('P105','Printer',-12000,10);<br>e) INSERT INTO ORDERS VALUES ('O5004','C1008','P101',2);<br>f) INSERT INTO ORDERS VALUES ('O5005','C1002','P108',1);<br>g) UPDATE ORDERS SET QUANTITY = 0 WHERE ORDER_ID='O5002';<br>h) DELETE FROM CUSTOMER WHERE CUSTOMER_ID='C1004';<br>********** | 10 | 1 | 3 |

| CUSTOMER_ID | CUSTOMER_NAME | EMAIL | CITY |
|---|---|---|---|
| C1001 | Arun Kumar | arun@gmail.com | Chennai |
| C1002 | Priva S | priva@gmail.com | Vellore |
| C1003 | Rahul R | rahul@gmail.com | Coimbatore |
| C1004 | Meena P | meena@gmail.com | Madurai |

| PRODUCT_ID | PRODUCT_NAME | PRICE | STOCK |
|---|---|---|---|
| P101 | Laptop | 65000 | 15 |
| P102 | Keyboard | 1200 | 50 |
| P103 | Mouse | 750 | 100 |
| P104 | Monitor | 15000 | 20 |

| ORDER_ID | CUSTOMER_ID | PRODUCT_ID | QUANTITY |
|---|---|---|---|
| O5001 | C1001 | P101 | 1 |
| O5002 | C1003 | P102 | 2 |
| O5003 | C1004 | P104 | 1 |


User_id
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User_ID
Email
Firstname
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