

**VIT**

Vellore Institute of Technology

Final Assessment Test – April 2025

Course: BITE302L - Database Systems

Class NBR(s): 2772 / 2779 / 2782

Time: Three Hours

Slot: B1+TB1

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions**(10 X 10 = 100 Marks)**

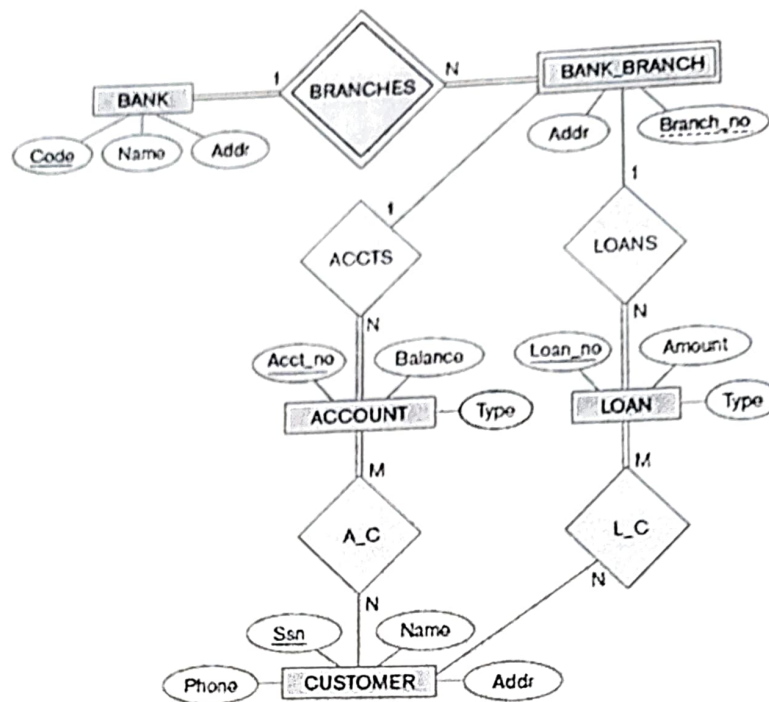
1. What are the different types of database end users? Discuss the main activities of each.

2. Consider a CONFERENCE_REVIEW database in which researchers submit their research papers for consideration. Reviews by reviewers are recorded for use in the paper selection process. The database system caters primarily to reviewers who record answers to evaluation questions for each paper they review and make recommendations regarding whether to accept or reject the paper. The data requirements are summarized as follows:

Authors of papers are uniquely identified by e-mail id. First and last names are also recorded. Each paper is assigned a unique identifier by the system and is described by a title, abstract and the name of the electronic file containing the paper. A paper may have multiple authors, but one of the authors is designated as the contact author. Reviewers of papers are uniquely identified by e-mail address. Each reviewer's first name, last name, phone number, affiliation, and topics of interest are also recorded. Each paper is assigned between two and four reviewers. A reviewer rates each paper assigned to him or her on a scale of 1 to 10 in four categories: technical merit, readability, originality, and relevance to the conference. Finally, each reviewer provides an overall recommendation regarding each paper. Each review contains two types of written comments: one to be seen by the review committee only and the other as feedback to the author(s).

Design an Entity-Relationship diagram for the CONFERENCE_REVIEW database. Indicate cardinality, participation and key constraint on the diagram.

3. Convert the following entity-relationship schema for a bank database into relational database schema and indicate the primary key and the foreign keys on schema.



4. Consider the following relational database schema relating to sale of cars from showroom. The primary keys are underlined. The foreign keys are self-explanatory.

SHOWROOM(Name, Address, Landmark, WhatsApp_no)

SELLS (WhatsApp, Model, Date_sold)

CAR (Model, Fuel_type, Transmission_type, Ex_showroom_price); transmission type can be automatic or manual.

Translate each of the following statements into an expression of relational algebra.

- Display name of the showrooms, its address and landmark and the model of the automatic car sold from the showroom. [2]
- Display the car model and its ex showroom price that had no sale between March 01, 2024 and September 30, 2024. [2]
- Display the name and WhatsApp number of the showrooms that sold petrol car prior to March 31, 2024. [2]
- Display the name and address of the showrooms that sold some automatic cars as well as those that sold some diesel car. [2]
- Display name and address of the showrooms that sold at least three petrol car on January 01, 2025. [2]

5. i) Which of the functional dependencies $X \rightarrow Y$, $XY \rightarrow Z$ and $Z \rightarrow Y$ is (are) [3]
satisfied by the following relation instance.

X	Y	Z
x ₁	y ₁	z ₁
x ₁	y ₁	z ₂
x ₂	y ₁	z ₁
x ₂	y ₁	z ₃

- ii) Find out whether the following sets of functional dependencies are [7]
equivalent.

$F_1 = \{A \rightarrow B, ABCD \rightarrow E, EF \rightarrow GH, ACDF \rightarrow EG\}$ and

$F_2 = \{A \rightarrow B, ACD \rightarrow E, EF \rightarrow G, EF \rightarrow H\}$.

6. Consider the relation schema $R(A, B, C, D, E, G, H)$ and the set of functional dependency

$F = \{A \rightarrow B, DE \rightarrow G, DG \rightarrow E, DH \rightarrow A, E \rightarrow H, EG \rightarrow D\}$ that holds on the relation schema R . Find out a key of R and decompose R into the highest possible normal form.

7. Consider the following relational database schema relating to customers' buying habits of products. The primary keys are underlined and the foreign keys are self-explanatory.

CUSTOMER(Cus_mobile, Cus_name, Cus_address, DoB)

BUYS(Prod_id, Cus_mobile, Quantity, Purchased_date)

PRODUCT(Prod_id, Name, Price, Date_manufactured)

Write down an SQL statement for the following queries.

- Remove information about the products that had not been purchased in the last thirty days.
- Display the name and mobile number of the customers aged above twenty years who purchased more than three products.
- Use nested query to display name and price of products purchased by customers living in Dadar area after March 31, 2025.
- Display name, price and manufacturing date of the products that have been purchased by at least one customer as well as those that had not been purchased by any of the customers so far.
- Display customer name and mobile number of the customers who did not purchase any product with its price ranging from 300 hundred rupees to 500 rupees.

8. a) Write down an unnamed PL/SQL block to display all even numbers between 1 and 50. [3]

- b) Consider the following relational database schema describing doctors treating patients. The primary keys are underlined and the foreign keys are self-explanatory. [7]

DOCTOR (Did, Name, Phone, Chamber)

TREATS (Did, Pid, Date_treated)

PATIENT (Pid, Pname, Address, Age).

Write down a named PL/SQL block *involving cursor* to display number of patients of different ages living in Telangana who were treated by Dr. Bhusan. If the number of patients for a particular age is more than 10 then display the message that 'The doctor was too busy', if the number of patients for a particular age is between 5 and 9 then display the message that 'The doctor was not very busy', otherwise, display the message that 'The area is safe at present'.

- 9.a) i) Define primary index, secondary index and clustered index. [3]
ii) Illustrate and explain the external merge-sort procedure for sorting data in a database. [7]

OR

- 9.b) Consider the following relational database schema relating to counselling of students. The primary keys are underlined. C_id and R_no are the foreign keys of the Counsels relation that refer to the counsellor and student relation respectively.

COUNSELOR(Counsellor_id, Cname, Office_Location)

COUNSELS (C_id, R_no, C_date)

STUDENT(Reg_no, Sname, Email, Branch)

Find out the best evaluation plan for the following query using heuristic optimization, showing the initial query tree, intermediate query trees and the optimal query tree.

Display counsellor name, student name and last counselling date (C_date) for students belonging to B.Tech. (Data Science), who received counselling after January 31, 2025 from counsellor whose office is in SJT building.

- 10.a) i) When are two database operations in a schedule said to be conflicting? [3]
ii) Draw the precedence graph for the following schedule [7]
 $r_3(Y); r_1(X); r_3(X); r_2(Z); r_2(X); w_3(Y); w_2(X); r_1(Z); w_1(Y); w_1(Z);$
Determine whether the schedule is serializable. If the schedule is serializable, write down an equivalent serial schedule.

OR

- 10.b) i) Distinguish between steal/no-force and no-steal/force strategy of buffer management in database recovery. [3]
ii) Write down a database recovery scheme based on deferred update. [7]

↔↔↔ W/D/TY ↔↔↔