SY

SES's Sridora Caculo College of Commerce and Management Studies, Mapusa - Goa

B.C.A (Semester III)

EXAMINATION OCTOBER / NOVEMBER 2026

MAJOR COURSE

CSA-201 Database Management Systems

Duration: 2 hrs **Max. Marks:** 60

Instructions: 1) All questions are Compulsory
2) Figures to the right indicate full marks

Q.1) Answer the following: **(6x2=12)**

i) Define data independence.

ii) Define DDL. Give any two DDL commands.

iii) State the purpose of the Rename (ρ) operator in relational algebra.

iv) Define serializability of schedules.

v) What is a Primary key?

vi) Define a derived attribute with an example.

Q.2A) i) Explain the components of the ER model (entity, attribute types and relationship) with a neat diagram. **(03)**

ii) Compare the Network and Object-Relational Data Models. **(02)**

OR

Q.2A)iii) Write a relational algebra expression to find the names of all students from the "Computer" department having Marks greater than 60 in the relation Student(SID, Name, Dept, Marks). **(03)**

iv) Explain total and partial participation in a relationship with a suitable example. **(02)**

Q.2B) Explain the integrity constraints (entity, referential, domain and key constraints) in a relational database. Why are they essential for maintaining data quality? **(05)**

C) Differentiate between 1NF and 2NF with a suitable example. **(02)**

Q.3A) i) Write a relational algebra expression to display the RoomNo and Type of all rooms from the table **Room**(RoomNo, Type, Rent) where Type = "AC" and Rent < 3000. State the schema of the resulting relation. **(03)**

Q.3A) ii) Define a Trigger. Mention one situation where a view is useful. **(02)**

OR

Q.3A)iii) Illustrate, with an example of two transactions, the difference between a serial schedule and a non-serial schedule. **(03)**

iv) Apply the COMMIT and ROLLBACK commands of TCL to show how a bank transfer of ₹500 is made permanent or undone. **(02)**

Q.3B) Given a relation R(StudentID, Course, Teacher) with the following functional dependencies: **(05)**
F: { StudentID, Course → Teacher ; Teacher → Course }
Identify the candidate keys, check whether R is in **3NF**, and if it is not decompose it. Comment on whether the decomposition preserves the dependencies.

C) Given a relation R(A, B, C, D, E) with functional dependencies **(02)**
A → B, BC → D, D → E, compute the closure {A, C}+ using Armstrong's axioms and state whether {A, C} is a candidate key.

Q.4A) i) Analyze if the following schedules involving transactions T1 and T2, can be reordered to make it conflict serializable? **(03)**

T1: R(A)

T2: W(A)

T2: R(B)

T1: W(B)

T1: R(C)

T2: W(C)

ii) Define view serializability. How does it differ from conflict serializability? **(02)**

OR

Q.4A)iii) Write a relational algebra query to retrieve the SIDs of students who are enrolled in both the "DBMS" and the "Java" courses. Use the relation: Enrollments(SID, CourseName). **(03)**

iv) Compare the union and intersection operations with a small example **(02)**

Q.4B) Design an Entity-Relationship Diagram (ERD) for an Online Shopping System based on the following requirements: **(05)**

Each Customer has a unique customer ID, name and phone number.

Each Product has a unique product ID, name and price.

A customer can place multiple orders, but each order is placed by exactly one customer. Each order has an order ID and an order date.

An order can contain multiple products, and a product can appear in multiple orders. Each product in an order should capture the quantity ordered.

Draw the ERD clearly showing: entities and their attributes, primary keys, relationship(s) with cardinalities, participation (total/partial) and any additional details if necessary.

C) Explain strict 2PL (locks). **(02)**

Q.5A) i) Explain three types of anomalies (insertion, deletion, update) caused by data redundancy, using the table StudentCourse(SID, SName, CourseID, CName) as an example. **(03)**

ii) Given: **Takes(StudentID, CourseID)** and **Mandatory(CourseID)**, write a relational algebra expression using the **division** operator to find students who have taken all the mandatory courses. **(02)**

OR

Q.5A)iii) Explain any three functions of a Database Administrator (DBA) **(03)**

iv) Explain BCNF giving an example. **(02)**

Q.5B) Analyze the relationship between the following entities: Author and Book. An author can write many books, and a book can be written by many authors. Every book must have at least one author, but an author may be registered without having written any book yet. Discuss the degree, cardinality and participation of this relationship, and justify how it would be converted into relational tables. **(05)**

C) Give one real-world example for each of the following relationships Unary (Recursive) relationship **(02)**

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