

CHUKA

UNIVERSITY



UNIVERSITY EXAMINATIONS

EMBU CAMPUS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE
IN COMPUTER SCIENCE

COSC 250: INTRODUCTION TO DATABASE SYSTEMS

STREAMS: BSc. COMP. SCI.

TIME: 2 HOURS

DAY/DATE: MONDAY 11/08/2025

2.30 P.M. – 4.30 P.M.

INSTRUCTIONS:

- Answer question **ONE** [Compulsory] and any other **TWO** questions.
- Do not write anything on the question paper

Question One (30 Marks)

- a) Define the term "database" and distinguish between a database and a Database Management System (DBMS). (4 marks)
- b) Compare and contrast the file system approach with the database approach for data management. Highlight THREE advantages of using DBMS over traditional file systems. (6 marks)
- c) Explain the role and responsibilities of a Database Administrator (DBA) in an organization. Describe FOUR typical work activities that a DBA performs. (6 marks)
- d) Data security is crucial in database systems. Explain THREE different database security measures that can be implemented to protect sensitive information. (6 marks)
- e) Define normalization and explain why it is important in relational database design. (4 marks)
- f) Distinguish between Data Warehouses and Data Marts, providing one example of each. (4 marks)

Question Two (20 Marks)

- a) Explain the following database models, highlighting their key characteristics and providing one advantage and one disadvantage for each:

- i) Hierarchical Model (3 marks)
 - ii) Network Model (3 marks)
 - iii) Object-Relational Database Model (3 marks)
- b) Consider a university database system that needs to store information about students, courses, and enrollments.
- i. Create an Entity-Relationship (ER) diagram for this scenario, showing at least THREE entities with their attributes and relationships. (6 marks)
 - ii. Convert your ER diagram into relational tables, showing primary keys and foreign keys. (5 marks)

Question Three (20 Marks)

- a) Explain the concept of database normalization and describe the first three normal forms (1NF, 2NF, and 3NF) with their requirements. (9 marks)
- b) Consider the following unnormalized table for a library system:

Book_Loan Table

Book_ID	Book_Title	Author_Name	Author_Phone	Member_ID	Member_Name	Loan_Date	Return_Date
B001	Databae Systems	John Smith	0712345678	M001	Alice Brown	15/01/24	15/02/24
B002	Network Security	Jane Doe	0723456789	M001	Alice Brown	20/01/24	20/02/24
B001	Database Systems	John Smith	0712345678	M002	Bob Wilson	25/01/25	25/02/25

- i) Identify the problems with this table design (3 marks)
- ii) Normalize this table to 3NF, showing all intermediate steps (8 marks)

Question Four (20 Marks)

- a) Structured Query Language (SQL) is the standard language for relational database management systems.
 - i. Explain the purpose of SQL and describe THREE main categories of SQL commands (5 marks)
 - ii. Write SQL statements to create a table called "EMPLOYEES" with the following structure:

Employee_ID (Primary Key, Integer)

First_Name (Variable character, 50 characters)

Last_Name (Variable character, 50 characters)

Department (Variable character, 30 characters)

Salary (Decimal, 10,2)

Hire_Date (Date)

(4 marks)

b) Database security threats are evolving constantly.

i. Explain what cryptography is and how it enhances database security. (3 marks)

ii. Describe the importance of disaster recovery planning in database administration.

(4 marks)

c) Distinguish between Online Analytical Processing (OLAP) and Online Transaction Processing (OLTP) systems, providing TWO characteristics of each. (4 marks)

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