MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

UNIVERSITY POSTGRADUATE EXAMINATION

2024/2025 ACADEMIC YEAR

FIRST YEAR **FIRST** SEMESTER EXAMINATION FOR MASTER

OF SCIENCE IN INFORMATION TECHNOLOGY AND COMPUTER SCIENCE

SIT802 - DATABASE SYSTEMS

DURATION:3 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer any FOUR questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

QUESTION ONE (25 MARKS)

a) Write an SQL query to retrieve the names of all students who have an end of semester score that is greater than 70%. (5 marks)

b) Describe the ACID properties of transactions in databases. (5 marks)

c) Discuss the advantages and disadvantages of using object-oriented databases compared to relational databases. (6 marks)

d) Evaluate the trade-offs between data consistency and availability in distributed database systems. (4 marks)

e) Describe the role of OLAP cubes in data warehousing and how they are used for analysis (5 marks)

QUESTION TWO (25 MARKS)

Consider the following case study:

Syracuse University is planning to implement a new database system to manage student records, course enrolments, and faculty information. They require a system that can efficiently handle large volumes of data, provide easy access for various stakeholders, and ensure data integrity and security.

Required:

a) Design an Entity-Relationship (ER) diagram for the University's database systems, considering all entities this architecture. (15 marks)

b) Identify the attributes for each entity and relationships between them. (10 marks)

QUESTION THREE (25 MARKS)

a) Explain the purpose of normalization in database design. (5 marks)

b) A new social media platform, BIMBO, is being developed. The platform will allow users to create profiles, post updates, comment on posts, and like or dislike content.

You have been approached as a database expert to assist in the design of a normalized database schema for the sound media platform. Propose a normalised database scheme considering entities such as users, posts, comments and likes. Ensure that the proposed database schema is in 3NF to avoid data redundancies and anomalies. (20 marks)

QUESTION FOUR (25 MARKS)

Blue Ray, a large online retailer, has migrated its entire database system to a cloud-based platform provided by a third–party cloud service provider (CPS). The retailer handles sensitive customer data, including credit card information, personal details, and purchase history.

a) Analyse any four potential security risks associated with cloud-based database. For each risk identified, discuss measures that can be implemented to mitigate these risks. (16 marks)

b) Propose a solution for handling inconsistent data in this Blue Ray cloud-based database system. Justify your solution. (9 marks)

QUESTION FIVE (25 MARKS)

a) Using appropriate examples, compare and contrast relational databases with NO SQL databases, focusing on their data models, scalability and use cases. (15 marks)

b) Discuss the trade-offs between using a centralized database versus a distributed database architecture. (10 marks)