UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
SECOND YEAR FIRST SEMESTER

FOR THE DEGREE OF BACHELOR OF SCIENCE
(INFORMATION TECHNOLOGY)

COURSE CODE: BIT 212

COURSE TITLE: INTRODUCTION TO DATABASES

DATE: 14/12/2023   **TIME:** 9.00 A.M. – 11.00 A.M.

INSTRUCTIONS
ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

a. Define the following terms: **[2 marks]**

   i. Database

   ii. Database management system (DBMS)

   iii. Entity

   iv. Attribute

b. What are the benefits of normalizing a database? **[3 marks]**

c. What is the main difference between a file system and a database? **[2 marks]**

d. Explain the difference between a primary key and a foreign key constraint. **[2 marks]**

e. Explain the ACID properties of database transactions. **[4 marks]**

f. What is object-oriented database design? **[2 marks]**

g. Normalize the following database table to 2nd NF **[5 marks]**

Customer ID	Name	Address	City	State	Zip code
1	John Doe	123 Main Street	Anytown	CA	91234
2	Jane Doe	456 Elm Street	Anytown	CA	91234
3	Peter Parker	789 Oak Street	Anytown	CA	91234
4	Mary Jane Watson	1011 Maple Street	Anytown	CA	91234

h. Write a SQL query to select all customers from the database table in question v who live in Anytown. **[3 marks]**

i. Explain the concept of locking as used in databases. **[3 marks]**

j. Explain the difference between an inner join and an outer join **[4 marks]**

QUESTION TWO [20 MARKS]

a. Write a SQL statement to create a table named customers with the following columns: customer_id (primary key), name, address, and phone_number. **[4 marks]**

b. Write a SQL statement to select all customers from the customers table who live in the city of "San Francisco". **[4 marks]**

c. Write a SQL statement to insert a new customer into the customers table with the following information: name = "John Doe", address = "123 Main Street", phone_number = "123-456-7890". **[4 marks]**

d. Write a SQL statement to update the customer record with the ID 1 to have the following information: name = "Jane Doe", address = "456 Elm Street", phone_number = "987-654-3210". **[4 marks]**

e. Write a SQL statement to delete the customer record with the ID 2 from the customers table. **[4 marks]**

QUESTION THREE [20 MARKS]

a. You are a database administrator for a large company. You are tasked with selecting a new DBMS for the company. What are some of the key criteria that you would consider when making your selection? **[10 marks]**

b. Design an E-R diagram for a university database system. The database should store information about students, courses, instructors, and enrollments. **[10 marks]**

QUESTION FOUR [20 MARKS]

a. What is a data model? **[2 marks]**

b. Compare and contrast the different database modeling techniques, including the hierarchical model, network model, relational model, ER model, and object-oriented model with regards to:

    i. Data Structure used to implement the model **[5 marks]**

    ii. Relationships the model can implement **[5 marks]**

c. A small business is considering switching from a file-based approach to a database system. Give TWO advantages and TWO disadvantages of each approach? **[8 marks]**

QUESTION FIVE [20 MARKS]

a. A company is concerned about the security of its database. What are some of the steps that the company can take to protect its database from unauthorized access and modification? **[10 marks]**

b. You are designing a distributed database system for a large e-commerce company. The company has multiple warehouses located around the world, and each warehouse needs to be able to access and update the database in real time. What are some of the challenges that you would need to consider when designing this system? **[10 marks]**