# MACHAKOS UNIVERSITY

**University Examinations for 2022/2023**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY**

**SECOND YEAR FIRST SEMESTER EXAMINATION FOR**

**BACHELOR OF SCIENCE (ELECTRICAL AND ELECTRONICS ENGINEERING)**

**BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)**

**BACHELOR OF SCIENCE (CLOUD COMPUTING)**

**BACHELOR OF EDUCATION**

**SIT 250/EEE 207: DATABASE SYSTEMS**

**DATE:** **TIME:**

## INSTRUCTIONS

*Instructions*
*This paper consists of FIVE questions*
*Answer **question one** and other **two questions** in this paper*

## QUESTION ONE (30 MARKS)

a) Define the following terms as used in database systems:
   (i) entity
   (ii) architecture
   (iii) database management system
   (iv) integrity
   (v) attribute
   (5 marks)

b) (i) Explain what you understand by the file system. (2 marks)
   (ii) Outline five limitations of the file system. (5 marks)
   (iii) Explain how database systems have addressed each of the limitations of the file system mentioned above. (5 marks)
   (iv) Use any abstract diagram of your choice to illustrate the difference between the file system and a database system. (6 marks)

c) (i) Explain what a Database Systems Environment is. (2 marks)
   (ii) List five components of the database systems environment. (5 marks)

## QUESTION TWO (20 MARKS)

a) (i) Define an Entity Relationship Diagram (ERD). (2 marks)
   (ii) Using suitable notations, describe the three elements that constitute an ERD. (6 marks)

b) (i) Briefly explain why a many-to-many relationship is first resolved (modified) before being implemented. (2 marks)

(ii) With the use of an appropriate example of your choice, describe with a diagram how to resolve a many-to-many relationship.

(iii) Draw a suitable ERD based on the following case study:

***The MKSU Library consists of several types of books. ISBN number, title, author and book type are some of the records kept about each of the books. Students may be allowed to borrow up to three books. A book may however be borrowed by only one student at a time. Admission number, names, course and year of study are the details of students that are recorded. A book may be authored by several writers and a writer may author several books as well. Author's number, names, gender and address are some of the details recorded.***

(6 marks)

c) Using an example, describe what referential integrity is. (4 marks)

**QUESTION THREE (20 MARKS)**

a) Describe FOUR stages of the database systems development lifecycle. (8 marks)

b) With the use of a diagram, explain the ANSI-SPARC database architecture. (8 marks)

c) Using an example, explain the difference between a primary key and a foreign key. (4 marks)

**QUESTION FOUR (20 MARKS)**

a) (i) Define the terms data normalization. (2 marks)

(ii) Normalize the following table to the 3rd Normal Form.

| **Product Code** | **Product Name** | **Price** | **Sales Rep No.** | **Sales Rep Name** | **Customer ID** | **Customer Name** | **Customer Since** |
|---|---|---|---|---|---|---|---|
| P001 | Pwani Oil | 600 | S11 | Charles | C1000 | Kempinsky | 2018 |
| P002 | Sunlight | 250 | S12 | Carol | C1100 | Serena | 2015 |
| P003 | Nivea | 550 | S13 | Tomkins | C1000 | Kempinsky | 2018 |
| P001 | Pwani Oil | 600 | S13 | Tomkins | C1500 | Windsor | 2010 |
| P005 | Sugar | 300 | S14 | Susan | C1500 | Windsor | 2010 |
| P003 | Nivea | 550 | S11 | Charles | C1550 | Stanley | 2005 |

(6 marks)

b) (i) Briefly explain what the Structured Query Language (SQL) is. (2 marks)

(ii) Name any THREE components of SQL, giving an example of a command used in each one of the components. (6 marks)

(iii) Write a suitable SQL statement to create the table given below:

| Product Code | Product Name | Price | Sales Rep No. | Sales Rep Name | Customer ID | Customer Name | Customer Since |
|---|---|---|---|---|---|---|---|

(4 marks)

**QUESTION FIVE (20 MARKS)**

a) (i) Explain what you understand by a database model. (2 marks)

(ii) Using suitable diagrams, describe FOUR database models in details highlighting the operational characteristics, strengths and weaknesses, as well as suitable application area of each. (12 marks)

b) Discuss THREE types of data base systems. (6 marks)