MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya
Tel: +254(0) 799 529 958, +254(0) 799 529 959, + 254 (0) 712 524 293,
Website: info@must.ac.ke Email: info@must.ac.ke

University Examinations 2024/2025

FOUR YEAR FIRST SEMESTER FOR THE DEGREE OF BACHELOR OF SCIENCE IN HEALTH RECORDS AND INFORMATION MANAGEMENT

HPR 3412: DATABASE CONSTRUCTION AND DESIGN

DATE: DECEMBER 2024 **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question **ONE** (Compulsory) and any other **TWO** questions*

QUESTION ONE (30 MARKS)

a) Define the following terms.
   i. Entity integrity (2 Marks)
   ii. Referential integrity (2 Marks)

b) Explain using examples how a DBMS performs the following functions. (6 Marks)
   i. Improving data sharing
   ii. Improving data security
   iii. Minimizing data redundancies

c) Briefly describe the four ANSI/SPARC architecture level of abstraction in relation to database management systems. (4 Marks)

d) Explain the type of update anomalies that may occur on a table that has redundant data. (4 Marks)

e) Explain the importance of normalization in database design. (4 Marks)

f) A company has several departments. Each department has a supervisor and at least one employee. Employees must be assigned to at least one, but possibly more departments. At least one employee is assigned to a project, but an employee may be on vacation and not assigned to any projects. The important data fields are the names of the departments, projects, supervisors and employees, as well as the supervisor and employee number and a unique project number.

   i. Identify the entities (2 Marks)
   ii. Draw a fully attributed ER-diagram (6 Marks)

QUESTION TWO (20 MARKS)

a) The following datatypes were used in a database table. Describe each of the datatype

i. Text (1 Mark)

ii. Number (1 Mark)

iii. Logic (1 Mark)

b) Explain the following database architectures. (8 Marks)

i. Single database

ii. Replicated database

iii. Partitioned database

iv. Cloud database

c) MUST hospital wishes to implement a multi-user, client/server database architecture to serve patients spread across the country. Using examples, discuss database components requirements that will meet the hospital's objectives. (5 Marks)

d) Explain any TWO circumstances under which an organization would implement a centralized database system. (4 Marks)

QUESTION THREE (20 MARKS)

a) The table below shows details of products in a hospital inventory system.

Prodnum	Prodname	Quantity	Unit_price	Supplier_name	Supply_date
1	CPU	50	20000	TKA	30/4/2024
2	Monitor	60	8000	NMK	31/5/2024
3	Keyboard	70	500	TKA	30/6/2024
4	Mouse	80	200	NCK	31/7/2024
5	Hard disk	90	4500	NCK	31/8/2024
6	Scanner	100	15000	NMK	30/9/2024

Write an expression that will extract records that satisfy the following conditions using SQL query statements.

i. List all products details starting with letter M. (3 Marks)

ii. List all products supplied by TKA computers. (3 Marks)

iii. List all products prodnum, prodname columns of all products with unit prices 20000, 4500, 500 and 15000. (3 Marks)

b) Write query expressions for the above table in question 3 to:

i. Group all records by Supplier_name (3 Marks)

ii. Sort all products by product name then by quantity in ascending order. (4 Marks)

iii. Calculate total quantity of all products. (4 Marks)

QUESTION FOUR (20 MARKS)

a) A company has several departments. Each department has a supervisor and at least one employee. Employees must be assigned to at least one, but possibly more departments. At least one employee is assigned to a project, but an employee may be on vacation and not assigned to any projects.

Draw an ERD diagram showing all possible attributes together with **PK** and **FK**.

(8 Marks)

b) Write SQL statements that would perform each of the following operations on the table named **Department**. (6 marks)

i. Make the field Dnumber, a primary key;

ii. Make the field Dname VARCHAR (50) not to accept a null value

iii. Make the field named Dnumber to hold values greater than 10

c) Ogolla, a database administrator, created an account for a user. Explain **THREE** privileges that the user may be granted. (6 Marks)

QUESTION FIVE (20 MARKS)

a) Consider the flat database shown below.

EmpNo	DeptNo	DeptName	EmployeeName	EmployeeGender
E001	D1	Human Resource	Francis Kimani	Male
E002	D2	Sales	Francisca Kamau	Female
E003	D3	Marketing	Benard Rotich	Male
E004	D1	Human Resource	Bernice Rotich	Female
E005	D2	Sales	Faith Wambua	Female

i. Identify and discuss three anomalies that may occur in this database. (6 Marks)

ii. Convert this table into the third normal form. (6 Marks)

b) Briefly describe the four properties of a transaction in a database (8 Marks)