(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR

SECOND YEAR 2ND SEMESTER EXAMINATIONS

DEGREE OF BACHELOR
IN
BCS & ETS

COURSE CODE: **BCS 221**
COURSE TITLE: **DATABASE SYSTEMS I**

DATE: THURSDAY 11TH APRIL, 2024 **TIME: 8:00AM – 10:00AM**

INSTRUCTIONS TO CANDIDATES

Answer Question **ONE (1)** and Any **OTHER 2** questions
Ensure your answers/ideas are clearly expressed
All your answers must be clearly numbered
Write in ink. Rough work can be done (in answer booklet) in pencil and will not be marked. Cross out any rough work.
Calculators, phones, tablets, computers not allowed

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

QUESTION ONE [30 Marks]

a) We can convert any weak entity set to a strong entity set by simply adding appropriate attributes. Why, then, do we have weak entity sets? Express this with an example of your choice **[3 Marks]**

b) What is the meaning of the term 'functional dependency'? Why is it important to establish functional dependencies during normalization? **[8 Marks]**

c) In your own word explain and with a relevant example, how data integrity is maintained within the database when concurrent users access the database **[5 Marks]**

d) List at least four responsibilities of a database management system. For each responsibility, explain the problems that would arise if the responsibility were not discharged, if these responsibilities were not met by a given DBMS, what problems can occur? **[8 Marks]**

e) Write the SQL CREATE TABLE statement for the **owns** relation between **Skier** and **PairOfSkis**. Make sure that your statement specifies the PRIMARY KEY and any FOREIGN KEYS. Additionally, we would like to enforce the constraint that purchase price be greater than zero. **[6 Marks]**

QUESTION TWO [20 MARKS]

A local authority manages several nurseries which provide daycare for children. They want to use the database to record information about their nurseries. Each nursery is identified by it's name. Each nursery is organized into several sections, each with about 15 children. The sections within each nursery have unique names, but there might be sections with the same name in different nurseries. The local authority employs several teachers and each teacher is assigned to one of the sections. Each teacher's name and person number should be stored in the database. The name and person number of each child should also be stored. Initially, an application is made for a nursery place for a child. The application contains information about the child, the child's starting date at nursery, and a list of nursery choices (e.g. choice 1 is nursery \A", choice 2 is nursery \B", etc.). After an application is processed, the child is allocated an available place in one of the sections of one of the nurseries. Information about the application and the child's placement should be stored in the database. For each child, the person number, name and telephone number of each parent should be stored in the database.

a) Draw an E-R diagram that correctly models this domain. **[8 Marks]**

b) Translate this E-R diagram into a set of relations, clearly marking all references and keys. If any attributes can contain null values, state which ones. **[12 Marks]**

QUESTION THREE [20 MARKS]

a) You are asked to design a database system for a health club. The database would contain data about customers, their training, contact numbers, etc. Show the main steps you would perform for designing and implementing the database. (Don't show the actual schemas!) **[10 Marks]**

b) Within the MMUST University environment, with relevant example describe how the database concepts have been implemented, including the major players **[10 Marks]**

QUESTION FOUR [20 MARKS]

The questions are based on the following relational schema:

Emp(*eid:* integer, *ename:* string, *age:* integer, *salary:* real)
Works(*eid:* integer, *did:* integer, *pcttime:* integer)
Dept(*did:* integer, *dname:* string, *budget:* real, *managerid:* integer)

i. Give an example of a foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when a user attempts to delete a Dept tuple? **[6 Marks]**

ii. Write an SQL statement to add John Doe as an employee with eid = 101, age = 32 and salary = 15, 000. **[4 Marks]**

iii. Define the Dept relation in SQL so that every department is guaranteed to have a manager. **[5 Marks]**

iv. Write an SQL statement to give every employee a 10 percent raise. **[5 Marks]**

QUESTION FIVE **[20 MARKS]**

a) A hospital drug dispensing record requires that, for each patient, the pharmacy must record the following information.

Pharmacy drug dispensing card

Patient No ..... Surname .....Sex.....
Date of Birth ..... Address .....

Ward No ..... Ward name .....Date.....
Name of company paying..... Company address.....

Date	Drug code	Drug name	Quantity	Unit price	Amount

Total .....
Paid .....
Balance .....

a) Explain what you understand by data normalization stating each of the three normal forms **[5 Marks]**
b) Perform data normalization for the table to 3NF. Showing clearly the results of each stage **[10 Marks]**
c) Draw an ER model for Pharmacy drug dispensing card, after 3NF **[5 Marks]**