



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY**

(MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

**SECOND YEAR SECOND SEMESTER EXAMINATIONS
FOR THE DEGREE**

OF

**BACHELOR OF SCIENCE
BEC/BES/MATHS**

COURSE CODE: BIT 213

COURSE TITLE: INTRODUCTION TO DATABASE SYSTEMS

DATE: Wednesday 20/04/2022

TIME: 12:00-2:00p.m

INSTRUCTIONS TO CANDIDATES

Question ONE (1) is compulsory
Attempt any TWO (2) questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION ONE [30 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!) [8 Marks]
- b) How are database structures at each of the three levels specified in most database management systems? [6 Marks]
- c) In your opinion, with reasons outline why an organization would want to embrace the use of database systems. [6 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 DBM, what problems can occur? [10 Marks]

QUESTION TWO [20 Marks]

- a) In your own word explain how data integrity is maintained within the database when concurrent users access the database [7 Marks]
- b) Explain the difference between logical and physical data independence. [7 Marks]
- c) 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? [6 Marks]

QUESTION THREE [20 Marks]

Consider the SQL query whose answer is shown below

sid	name	login	age	gpa
1234	Grace	grace@mmust	19	1.9
5678	John	john@mmust	20	2.0

Students with $age < 18$ on Instance S

- i. Write a query that will return the above table without the condition in place assuming there are only two records in the table [3 Marks]
- ii. Modify this query so that only the *login* column is included in the answer. [5 Marks]
Only *login* is included in the answer:
- iii. If the clause $WHERE S.gpa \geq 2$ is added to the original query, what is the set of tuples in the answer, and why? [5 Marks]
- iv. Write a query that will return the highest GPA without using *ORDERBY* or *LIMIT*[7 Marks]

QUESTION FOUR [20 Marks]

Use the following table to answer the questions that follow:

WORK.RECORD

Emp No	EmpName	Project No.	Project Name	Dept. No.	Dept. Loc.	Grade No	Grade Title	Start Date
4321	Omondi	PA2.32	Alpha	DA32	KSM	GR1	Grinder	24/7/07
3987	Lucy	PA2.32	Alpha	DA56	NKR	GR1	Grinder	24/7/07
6745	Omondi	PA5.90	Alpha	DA32	KSM	FN1	Packer	3/8/06
4519	Mtua	PA8.19	Omega	DA09	KSM	FN1	Packer	30/3/07
						GR2	Grinder	23/2/09
						GR3	Grinder	21/2/10

- What is the meaning of the term 'functional dependency'? [4 Marks]
- Convert the table into first Normal form [2 Marks]
- Why is it important to establish functional dependencies during normalization? [4 Marks]
- Give **TWO** reasons why the WORKRECORD table is not in third normal form. [4 Marks]
- Fully identify at least one occurrence of redundant data. [2 Marks]
- Write down the functional dependencies implied by the table. [4 Marks]

QUESTION FIVE [20 Marks]

- Explain the benefits of using ER data modelling techniques to assist in the design of a relational database. [6 Marks]
- MMUST database needs to store information about employees (identified by *PFNO.*, with *salary* and *phone* as attributes), departments (identified by *dno*, with *dname* and *budget* as attributes), and children of employees (with *name* and *age* as attributes). Employees work in departments; each department is *managed by* an employee; a child must be identified uniquely by *name* when the parent (who is an employee; assume that only one parent works for MMUST) is known. We are not interested in information about a child once the parent leaves the MMUST.

Draw an ER diagram that captures this information.

[14 Marks]