



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS  
2021/2022 ACADEMIC YEAR  
SUPPLIMENTARY EXAMS  
FOR THE DEGREE OF BACHELOR  
OF  
COMPUTER SCIENCE**

**COURSE CODE:** BCS 221/BIT 213

**COURSE TITLE:** INTRODUCTION TO (DATABASE SYSTEMS I)

**DATE:** MONDAY 01-08-2022

**TIME:** 8:00a.m-10:00a.m

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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

- What are the two types of null value that are most common? (Give an example of their use.) [4 Marks]
- Explain the following terms briefly with appropriate example: attribute, relationship, one-to-many relationship and many-to-many relationship. [6 Marks]
- Explain the difference between physical and logical data independence. [4 Marks]
- Why would you choose a database system instead of simply storing data in operating system files? When would it make sense not to use a database system? [10 Marks]
- What are 'Integrity Constraints'? What role do they play in a DBMS? [6 Marks]

## Question Two

- Consider the following table instance chart

Table name: EMPLOYEE

Column Name	EMP_ID	EMP_NAME	ADDRESS	JOIN DATE
Key Type	PK			
Null/Unique	NN, U	NN		NN
Default Value				System Date
Check	1 to 999999			
Data Type	Number	VARCHAR2	VARCHAR2	Date
Length	10	30	50	

Create the EMPLOYEE table based on the table instance chart shown above. Choose the appropriate data types and be sure to add integrity constraints [6 Marks]

- What is meant by second normal form (2NF)? Examine the following table to check if it is in 2NF. If yes, explain your answer. If not, convert the table into 2NF. [6 Marks]

staffNo	branchNo	branchAddress	name	position	hoursPerWeek
S4555	B002	City Center Plaza, Seattle, WA 98122	Ellen Layman	Assistant	16
S4555	B004	16 – 14th Avenue, Seattle, WA 98128	Ellen Layman	Assistant	9
S4612	B002	City Center Plaza, Seattle, WA 98122	Dave Sinclair	Assistant	14
S4612	B004	16 – 14th Avenue, Seattle, WA 98128	Dave Sinclair	Assistant	10

- Discuss any four field properties in MS Access [8 Marks]

## Question Three

- A publishing company produces academic books on various subjects. Books are written by authors who specialise in one or more particular subjects. The company employs a number of editors who do not have particular specialisations but who take sole responsibility for editing one or more publications. A publication covers a single subject area but may be written by one or more authors -- the contribution of each author is recorded as a percentage for the purposes of calculating royalties.

Draw an ER diagram to represent the above specification:

[10 Marks]

- b) What are the three key components of relational database design? [5 Marks]
- c) It is possible to convert any weak entity set to a strong entity set by simply adding appropriate attributes. Why, then, do we have weak entity sets? [5 Marks]

### Question Four

- a) Describe the ANSI/SPARC three level architecture for database management systems software and explain the advantages it provides. [8 Marks]
- b) How are database structures at each of the three levels specified in most database management systems? [6 Marks]
- c) With examples discuss what you understand by cardinality in database system? [6 Marks]

### Question Five

- a) Design an E/R diagram describing the following domain: [15 Marks]
- i. A **Person** has attributes **pid (key)** and **name**.
  - ii. A **Skier** is a type of **Person** with attribute **aptitude**.
  - iii. A **Snowboarder** is a type of **Skier**.
  - iv. A **PairOfSkis** has attribute **sid (key)** and **model**.
  - v. A **Snowboard** has attribute **sid (key)** and **model**.
  - vi. A **Skier** owns zero or more **PairOfSkis**. The ownership relation has a purchase price. A **PairOfSkis** is owned by at most one **Skier**.
  - vii. A **Snowboarder** owns zero or more **Snowboards**. The ownership relation has a purchase price. A **Snowboard** is owned by at most one **Snowboarder**.
  - viii. A **Person** can rent a **PairOfSkis** or a **Snowboard**. A person cannot rent more than one **PairOfSkis** or one **Snowboard** at the same time. A person cannot rent a **PairOfSkis** and a **Snowboard** at the same time either. A piece of equipment can be rented by at most one person at a time. The rental comes with a start date and an end date.
- b) Explain the benefits of using ER data modelling techniques to assist in the design of a relational database. [5 Marks]