MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE OF BACHELOR

OF

SIT/SIK

COURSE CODE: BIT 213

COURSE TITLE: INTRODUCTION TO DATABASE SYSTEMS

DATE: 20/12/2022 **TIME:** 8:00-10:00AM

INSTRUCTIONS TO CANDIDATES

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

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

QUESTION ONE [30 Marks]

a) Explain the difference between logical and physical data independence.   **[5 Marks]**

b) Explain the benefits of using ER data modelling techniques to assist in the design of a relational database.   **[7 Marks]**

c) 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. Modify this query so that only the *login* column is included in the answer. **[5 Marks]**
      Only *login* is included in the answer:

   ii. If the clause WHERE *S.gpa* >= 2 is added to the original query, what is the set of tuples in the answer?   **[3 Marks]**

d) In your own word explain how data integrity is maintained within the database when concurrent users access the database   **[7 Marks]**

e) Explain the difference between logical and physical data independence.   **[7 Marks]**

QUESTION TWO

Imagine that you have been assigned to a team that will be developing an inventory tracking system. As part of the project startup, your manager has asked each team leader to bring a basic work plan to the next meeting. At that meeting, these work plans will be analyzed to determine the overall project timeframe, costs, personnel requirements and software requirements. For now, as the team leader for the data design team, you have been asked to bring a work plan that identifies the phases of data design and includes the following information for each phase:

   a) A description of the data design phase,
   b) The inputs of the phase,
   c) The outputs of the phase,
   d) A key issue addressed in the phase
   e) A challenge that you can anticipate would occur in the phase.

QUESTION THREE

Ebebewa K Ltd prides itself on having up-to-date information on the processing and current location of each shipped item. To do this, Ebebewa K Ltd relies on a company-

wide information system. Shipped items are the heart of the Ebebewa K Ltd product tracking information system. Shipped items can be characterized by item number (unique), weight, dimensions, insurance amount, destination, and final delivery date. Shipped items are received into the Ebebewa K Ltd system at a single retail center. Retail centers are characterized by their type, uniqueID, and address. Shipped items make their way to their destination via one or more standard Ebebewa K Ltd transportation events (i.e., flights, truck deliveries). These transportation events are characterized by a unique scheduleNumber, a type (e.g, flight, truck), and a deliveryRoute.

Please create an Entity Relationship diagram that captures this information about the Ebebewa K Ltd system. Be certain to indicate identifiers and cardinality constraints.

[20 Marks]

QUESTION FOUR

Production tracking is important in many manufacturing environments (e.g., the pharmaceuticals industry, children's toys, etc.). The following ER diagram captures important information in the tracking of production. Specifically, the ER diagram captures relationships between production lots (or batches), individual production units, and raw materials.
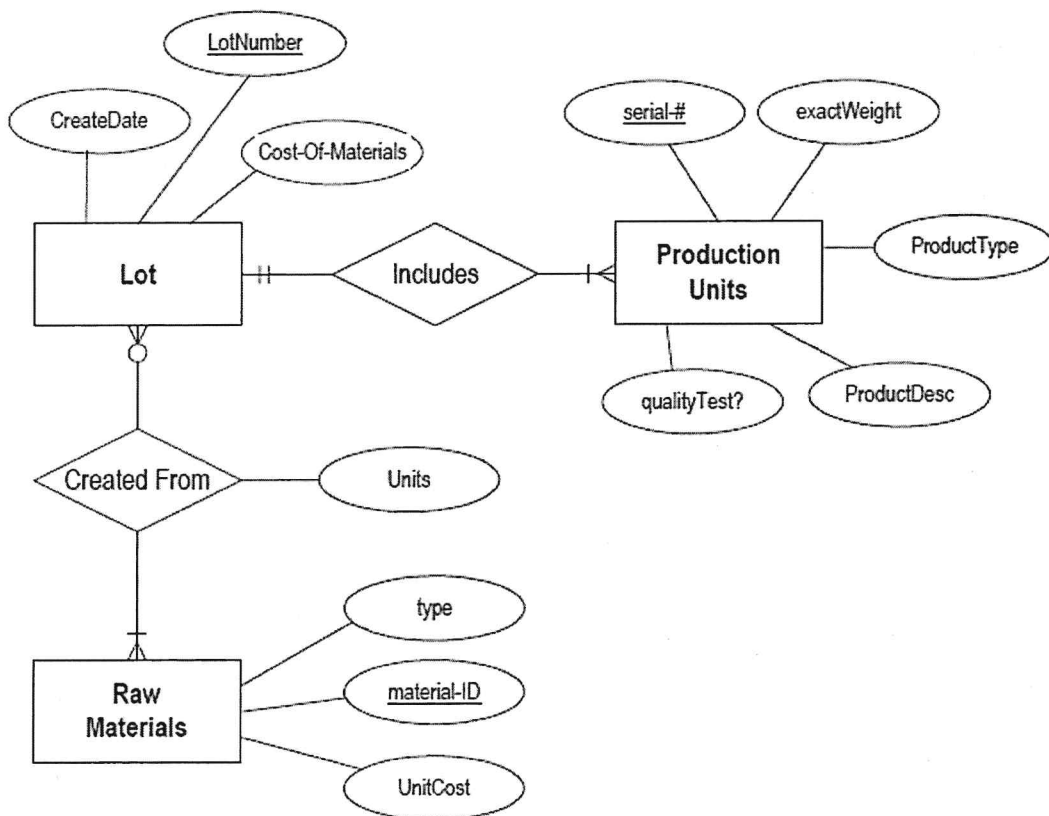
Please convert the ER diagram into a SQL database schema. Be certain to indicate primary keys and referential integrity constraints. **[20 Marks]**

QUESTION FIVE

Consider the following SQL definitions

Create table SF (StudId Varchar(4),

School Varchar(50)

PRIMARY KEY (StudId)

UNIQUE   (StudId, School);

Create table CF (CourseId Varchar(4),

School Varchar(50)

PRIMARY KEY (CourseId)

UNIQUE   (CourseId, School);

Create table SCF (StudId Varchar(4),

CourseId Varchar(4),

School Varchar(50)

PRIMARY KEY (StudId,CourseId)

FOREIGN KEY (StudId, School) REFERENCES SF (StudId, School)

FOREIGN KEY (CourseId, School) REFERENCES CF (CourseId, School)) ;

a) What problem was the designer solving?   **[6 Marks]**
b) What possible problem remains in this solution? **[6 Marks]**
c) Describe and comment on the particular features of SQL that make this Solutions possible**[8 Marks]**