MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

SIT 351 DATABASE IMPLEMENTATION

DATE: 13/4/2023 **TIME: 2:00 – 4:00 PM**

Instructions:

This paper consists of FIVE questions

*Answer question **ONE** and other **TWO** questions in this paper*

QUESTION ONE (30 MARKS) COMPULSORY

a) Distinguish between logical and physical data independence as used in database systems (4 marks)

b) Explain Three factors you would consider when selecting a DBMS to implement in an organization (6 marks)

c) Analyze Three types of failure that may occur in database system (6 marks)

d) Given the following scenarios, identify the possibility of a deadlock occurring (6 marks)

i.) Read_Item(T1, X), Read_Item (T2, X), Write_Item (T1, X)
Write_Item (T2, X), Commit (T1), Commit (T2)

ii.) Read_Item (T1, X), Write_Item (T1, X), Read_Item (T2, X)
Write_Item (T2, X), Commit (Ti), Commit (T2)

e) With respect to the relational data model, describe entity integrity and referential integrity constraints (4 marks)

f) Explain the significance of backup and replication ability of the database management systems (4 marks)

QUESTION TWO (20 MARKS)

a) Using a suitable example, explain the procedure of mapping a 1:1 mandatory at both ends relationship (6 marks)

b) Transaction T1 intends to insert a row into Table1 while transaction T2 intends to read several row from the same table. Explain FOUR anomalies that may occur if the two transactions are not executed in isolation (8 marks)

c) The following relations are part of a relational database.

Resort (ResortID, ResortName, Address)

Hotel (HotelID, ResortID, HotelName, Rating, Price)

Customer (CustomerID, CustomerName, Address)

Reservation (ResortID, CustomerID, FromDate, ToDate, HotelID)

The primary key in each table is shown by underlining.

Write expressions in SQL for the following:

i. Create tables for Resort and Customer entities (3 marks)

ii. Retrieve a list of all hotels, showing the reservations for the 5 June 2001. For each reservation show the CustomerID. You should include in your list hotels that have no reservations. (5 marks)

QUESTION THREE (20 MARKS)

a) The following fields are part of a large table in a database. The underlined fields are key attributes.

SalesOrderNo, Date, CustomerNo, CustomerName, CustomerAdd, ClerkNo, ClerkName, ItemNo, Description, Qty, UnitPrice

Normalize this database to second normal form (8 marks)

b) Given the following SQL syntax, explain the expected output:

i) SELECT * FROM [Person].[Person]
WHERE [FirstName] LIKE 'a%' ;

ii) ALTER TABLE Employees
ADD Salary int; (4 marks)

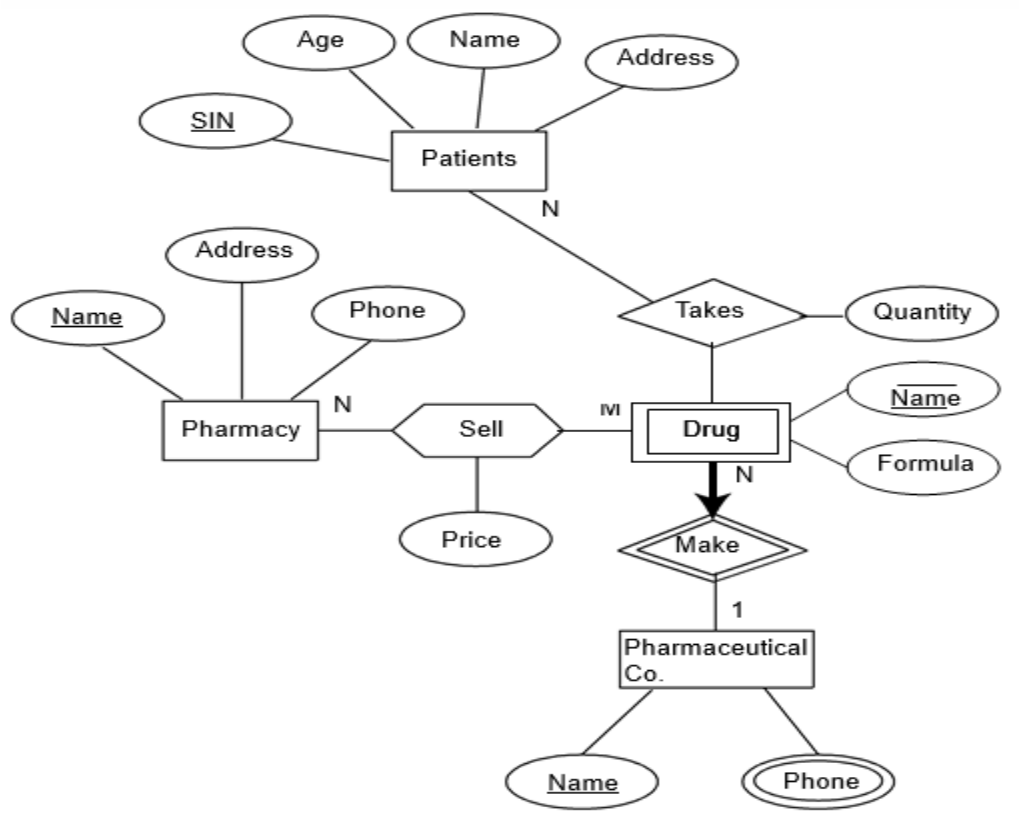
c) Explain the techniques and precautions that can be used in the following:

i. Allowing users to connect to the database (4 marks)

ii. Authorizing users to perform certain actions within the database (4 marks)

QUESTION FOUR (20 MARKS)

a) Given the ER diagram below, translate it into a relational model (10 marks)



b) Outline Five advantages of using a database system over the use of spreadsheets (5 marks)

c) Consider the following two-phase locking protocol. Suppose a transaction *T* accesses (for read or write operations), a certain set of objects {*O*1,...*Ok*}

This is done in the following manner:

Step1. *T* acquires exclusive locks to *O*1,...*Ok* in increasing order of their addresses.

Step2. The required operations are performed.

Step3. All locks are released.

Explain whether this lock will guarantee deadlock freedom (5 marks)

QUESTION FIVE (20 MARKS)

a) A manufacturing company produces products. The following product information is stored: product name, product ID and quantity on hand. These products are made up of many components. Each component can be supplied by one or more suppliers. The following component information is kept: component ID, name, description, suppliers who supply them, and products in which they are used.

Create an ERD to show how you would track this information.

Show entity names, primary keys, attributes for each entity, relationships between the entities and cardinality. (10 marks)

b) Use the table below to answer the questions that follow (10 marks)

studentID	**FullName**	**sat_score**	**rcd_updated**
1	Monique Davis	400	15:34:50
2	Teri Gutierrez	800	13:34:50
3	Spencer Pautier	1000	15:34:50
4	Louis Ramsey	1200	14:34:50
5	Alvin Greene	1200	15:35:33
6	Sophie Freeman	2400	13:35:33
7	Edgar Frank	1000	15:35:33

i. Write an SQL statement to delete the column rcd_updated (2 marks)

ii. Write an SQL statement to display the table in ascending order based on sat_score (4 marks)

iii. Write an SQL statement to display the list of students with a sat_score above 1000 and was updated after 15:33. (4 marks)