DAR ES SALAAM INSTITUTE OF TECHNOLOGY
COMPUTER STUDIES DEPARTMENT
End Semester Examination
SEMESTER II - 2020/2021
CEU 07401 Database Concepts and Design
Beng20 COE & ETE

TIME: 3:00 HRS

DATE: July 2021

Instructions

1. This paper consists of **TWO** sections, **A** and **B**.

2. Answer **ALL** questions in **Section A** and **ANY FOUR** questions from **Section B**.

3. Cellular phones are not allowed in the examination room.

4. Write your examination number on every page of your answer booklet (s) provided.

5. You are not allowed to write anything in the question paper.

6. The use of computers is **STRICTLY NOT ALLOWED**.

This paper consists of 4 printed pages.

SECTION A

QUESTION ONE

[7.5 MARKS]

a) What does it mean to say that a database displays both entity integrity and referential integrity?

[1 mark]

b) Why are entity integrity and referential integrity important in a database? [1 mark]

c) What is normalization interms of database design?

[0.5 mark]

d) What is denormalization interms of database design?

[0.5 mark]

e) When is a table in 1NF, 2NF, 3NF, and BCNF?

[2 marks]

f) A database approach uses different data models. Which data model should be chosen under which circumstances and why?

[1.5 mark]

g) Write a query to find the flight numbers of all the flights originating from Kilimanjaro which depart after "13:00".

[1 mark]

SECTION B

QUESTION TWO

a) The table shown in the Figure 0 below is susceptible to update anomalies. Provide examples of insertion, deletion, and modification anomalies [6 marks]

Staff#	DentistName	p#	pName	appointment		S#
				Date	Time	
S11	Wang Shuai	P10	Wang Hong	12.08.20	10:00	S10
S11	Wang Shuai	P10	Jack River	13.08.20	11:00	S10
S14	Adam John	P10	George Doe	12.09.20	10:00	S10

S14	Adam John	P10	George Doe	14.09.20 10:00	S10
S12	Alex John	P10	Jack River	14.10.20 16:30	S10
S12	Alex John	P10	Peter John	15.10.20 18:00	S10

Figure 0: Details of Patient Dental Appointment

b) Ccompare and contrast between cloud computing and Distributed Database Management Systems **[1.5 marks]**

QUESTION THREE **[7.5 marks]**

The academic world is an interesting example of international cooperation and exchange. This problem is concerned with modeling of a database that contains information on researchers, academic institutions, and collaborations among researchers. A researcher can either be employed as a professor or a lab assistant. There are three kinds of professors:Assistant, associate, and full professors. The following should be stored:

- For each researcher, his/her name, year of birth, and current position (if any).
- For each institution, its name, country, and inauguration year.
- For each institution, the names of its schools (e.g. School of Law, School of Business, School of Computer Science,. . .). A school belongs to exactly one institution.
- An employment history, including information on all employments (start and end date, position, and what school).
- Information about co-authorships, i.e., which researchers have co-authered a research paper. The titles of common research papers should also be stored.

- For each researcher, information on his/her highest degree (BSc, MSc or PhD), including who was the main supervisor, and at what school.
- For each professor, information on what research projects (title, start date, and end date) he/she is involved in, and the total amount of grant money for which he/she was the main applicant.

a) Draw an E/R diagram for the data set described above. Make sure to indicate all cardinality constraints specified above. The E/R diagram should not contain redundant entity sets, relationships, or attributes. Also, use relationships whenever appropriate. If you need to make any assumptions, include them in your answer **[3 marks]**

b) Convert your E/R diagram from question a) into relations, and write SQL statements to create the relations. You may make any reasonable choice of data types. Remember to include any constraints that follow from the description of the data set or your E/R diagram, including primary key and foreign key constraints.
[4.5 marks]

QUESTION FOUR
[7.5 marks]

a) Describe any two different architectural models for Database as a service **[2 marks]**

b) Explain what is meant by a transaction and why it is an important unit of operation in a DBMS? **[1 mark]**

c) Discuss the "ACID" properties of transactions with examples **[1.5 marks]**

d) i) Write down syntax for creating user, granting and Revoking privilege on MySQL **[2 marks]**

   ii) Translate the following SQL query to relational algebra: **[1 marks]**

```
SELECT  user,  COUNT(friend)  AS  friends
FROM   Friends
GROUP    BY   user
```

QUESTION FIVE

[7.5 MARKS]

a) With neat sketch, briefly explain two types of database Architecture [2 marks]

b) With support of syntax, briefly explain [2 marks]

   i. Data manipulation language

   ii. Data Query language

   iii. Data control language

   iv. Transaction control language

c) What are the main phases involved in database design? [2 marks]

d) Discuss classification of Database system [1.5 marks]

QUESTION SIX

[7.5 marks]

Perform the 3NF for the following given set of Sales Record data from an online retailer company called MastaBook. [7.5 marks]

Name	Item	Phone #	SubsLevel	Manufacturer	Manufacturer Phone#	Price
John Li	Sneakers	12345	Prime	Victoria	700-VICTORY	70.25
Gu Jie	Ipad, Ric	678910	Free	Wholesle	Contact US	76.11
Gu Jie	Laptop	678911	Free	Leslie	777-FREE2	5.66
Kai Le	Avocardo	111213	Prime Plus	N. Supermarket	444-Ginger	17.35
John Li	Win. AC	141516	Prime	LG	178920	45.12

QUESTION SEVEN

[7.5 marks]

a) Describe any two responsibilities of a database management system. For each responsibility, explain the problems that would arise if the responsibility were not discharged

[2 marks]

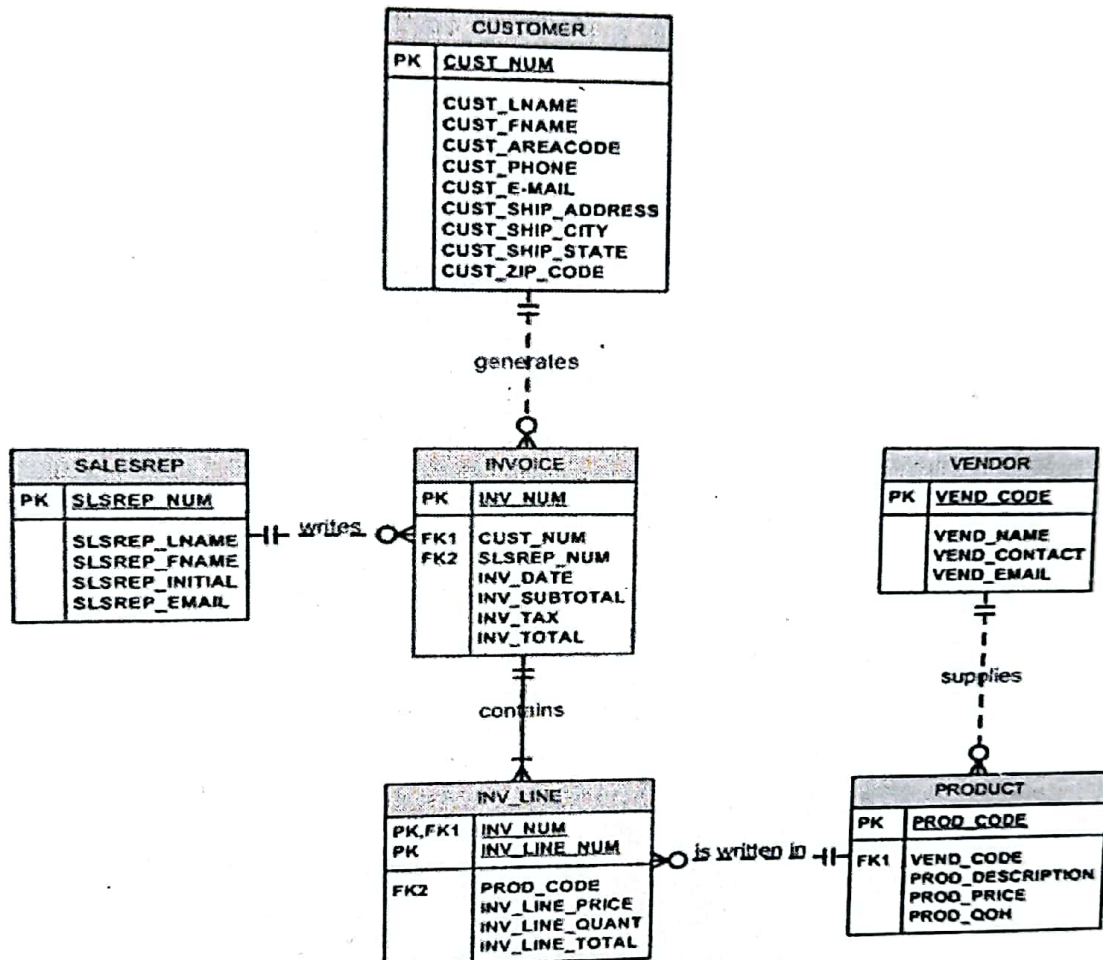b) Implement the Sales Internal Model (SIM) for the given Sales Conceptual Model (SCM) shown in the Figure 1 below:

[5.5 marks]

Figure 1: Sales Conceptual Model