



NATIONAL UNIVERSITY OF LESOTHO

Department of Mathematics and Computer Science
BSc, BEng, BA Supplementary Examinations
CS3432- Principles of Database Design and Data Management

August 2023

Marks: 100

Time: 3 hours

Instructions:

- Answer *Question 2* and any other *four* questions.
- The question paper consists of *three (3)* printed pages.

Question One

- Write down any four roles of a DBMS. [8]
- Write down any two disadvantages of database systems. [4]
- Write down any four importances of data models in database development. [4]
- Write down any four sources of business rules. [4]

Question Two

In a health care facility patients normally make appointments before consultation. In the appointment, the date and time of appointment, the details of the patients and the doctor are recorded. The doctor information includes name, specialty, and department the doctor usually attends to many patients and a patient may be attended by different doctors during one consultation or during different consultations. A maximum of three doctors is allowed in one consultation of any particular patient. Patient information includes, the name, age, gender, place of residence, national Id number and the passport number. During the consultation, the doctor details, the patient details, the type of illness, and the date of consultation are recorded. The consultation usually refers to the appointment made earlier and such appointment is flagged to show that the patient has seen the doctor. The doctor will make a prescription for each consultation that will include the patient, prescribed drugs, date of prescription and the prescribing doctor. The drug information usually includes the name of the drug, the category of the drug, the illnesses it heals.

For the following questions if there is a need to include some keys/attributes that are not explicit in the case, highlight them.

- Develop an Entity Relationship Diagram using Chen model for the case above. [10]
- Develop a relational diagram that represents the information in the case above. [10]

Question Three

- a) Explain what stored procedures are. [2]
- b) Write down two advantages of using stored procedures. [4]
- c) Explain the difference between a stored procedure and a stored function. [2]
- d) Explain with examples the difference between INNER JOIN and OUTER JOIN. [2+4]
- e) Write down a stored procedure that deletes all the patient data in all the tables identified in question 2. [6]

Question Four

- a) Write down one problem with unnormalized tables. Give an example. [2]
- b) Give two situations where denormalization may be preferred. [4]
- c) Consider the following table. Clearly showing all the steps, normalize this table up to 3NF. Write down the requirements for each normal form before converting to the next normal form. [14]

Order No	Customer Name	Date of Order	Sales Rep	Rep Name	Item Code	Item Description	Supplier Code	Supplier Name
1020	Pulane	01/01/2023	242	Spinach	4411	Friesland	15	BP
					4012	Jersey	22	RS
					4021	Ayrshire	13	PQ
1021	Lerato	01/01/2023	241	Mahlaba	4021	Ayrshire	13	PQ
					4012	Jersey	22	RS
					4015	Guernsey	23	CD
1130	Tlalane	01/01/2023	242	Spinach	4012	Jersey	22	RS
					4021	Ayrshire	13	PQ
1131	Motlatsi	01/01/2023	241	Mahlaba	4015	Guernsey	23	CD
					4411	Friesland	15	BP

Question Five

Draw the tables then write down the sql statements that create the tables identified in **Question 2**, enforcing the referential and entity integrity constraints that may be identified. [20]

Question Six

Use the case in **Question 2** to answer this question.

- a) Write down the sql statement that displays all appointments whose patients have not seen the doctor so far. [5]
- b) Write the sql statement that displays Consultation information as follows: Date of consultation, Patients Name, Doctors name. [5]

- c) Write down the sql statement that displays prescription information as follows: Doctors name, Name of drug, patients name. [5]
- d) Write down a trigger that creates patients appointment record when a new patient is recorded in the database . [5]

Question Seven

- a) Write down any three problems that normally arise in in a multi user environment where data is shared and accessed by several transactions. Give example to demonstrate you answer. [9]
- b) Explain with an example what a deadlock is. [3]
- c) Mention any two techniques that can be used to control a deadlock. [2]
- d) Explain what Time Stamping is, in concurrency control. [2]
- e) Explain two fundamental properties of time stamps. . [4]