



STRATHMORE UNIVERSITY
BACHELOR OF COMPUTER NETWORKS & CYBER SECURITY
END OF SEMESTER EXAMINATION
UNIT CODE: CNS 1201 DATABASE & ENTERPRISE SYSTEMS

DATE: 8th December 2023

Time: 08:00-10:00 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.
3. Do not write on the question paper.

QUESTION ONE (30 Marks)

- a) With relevant examples, differentiate a database from a database management system. **(4 Marks)**
- b) The ANSI-SPARC database architecture uses three levels of abstraction. Differentiate between each of these three levels of abstraction. **(3 Marks)**
- c) Why is the three-tier client-server architecture model most suited for web and mobile application implementations? **(4 Marks)**
- d) With Examples, define the two principal integrity rules for the relational model. Discuss why it is desirable to enforce these rules. **(4 Marks)**
- e) Define the following terms as used in Database Systems:
- i. Candidate Key **(1 Mark)**
 - ii. Foreign Key **(1 Mark)**
- f) Consider the follow schema descriptions;
- Hotels (hotel No, hotel Name, city)*
- Rooms (room No, hotel No, type, price)*
- Bookings (guest No, date From, date To, room No)*
- Guests (guest No, guest Name, guest Address)*
- Where:

Hotel contains hotel details,
Room contains room details for each hotel,
Booking contains details of bookings,
Guest contains guest details.

Using the above schemas, perform the following relational algebra operations.

- i). A selection operation for all hotels in the city of 'MOMBASA'. **(2 Marks)**
- ii). A projection for all attributes participating in the primary key in the relation Room. **(2 Marks)**
- g) Database Security essentially refers to protection of the information content in a database. Briefly explain the concepts of Confidentiality, Integrity and Availability in relation to database security and how you would achieve them in a database **(6 Marks)**
- h) What is the difference between a Shared Lock and an Exclusive Lock **(3 Marks)**

QUESTION TWO (15 Marks)

- a. All transactions done in the databases should possess certain properties known as the ACID properties. Giving relevant supporting examples, discuss each of these properties **(8 Marks)**
- b. Discuss the difference between a Serial and Non-Serial Schedule **(2 Marks)**
- c. What is SQL Injection attack? **(2 Marks)**
- d. Describe how a denial-of-service attack generally occurs and what are the possible countermeasure to help mitigate this type of attack? **(3 Marks)**

QUESTION THREE (15 Marks)

Using the DreamHome Relations attached, write SQL scripts to achieve the following:

- a) List the addresses of all branch offices in London or Glasgow. **(2 Marks)**
- b) List all staff with a salary between £20,000 and £30,000. **(2 Marks)**
- c) Produce a list of **monthly** salaries for all staff, showing the staff number, the first and last names, and the salary details. **(2 Marks)**
- d) List the details of all viewings on property PG4 where a comment has not been supplied. **(2 Marks)**

- e) List all staff. **(2 Marks)**
- f) List the staff who work in the branch at ‘163 Main St’. **(3 Marks)**
- g) List the property numbers of all properties that have been viewed. **(2 Marks)**

QUESTION 4 (15 Marks)

- a. Using the Sample Patient/Dentist table below explain **THREE** anomalies that can occur in databases. Use an example from the table to support your answer. **(6 Marks)**
- b. The table shown below lists Sample dentist/patient appointment data. A patient is given an appointment at a specific time and date with a dentist located at a particular surgery. On each day of patient appointments, a dentist is allocated to a specific surgery for that day. Apply normalization to the table below to achieve the 3rd Normal Form. Show **ALL** steps. **(9 Marks)**

Sample Patient/Dentist

StaffNo	DentistName	PatientNo	PatientName	Appointment		Surgery No
				Date	Time	
D101	James Meno	P100	Grace Njoki	12-sep-22	11:00	S115
D101	James Meno	P105	Teresia Anyango	12-sep-22	12:00	S115
D103	Jane Katoto	P108	Leah Chebet	12-sep-22	10:00	S110
D103	Jane Katoto	P108	Leah Chebet	14-sep-22	14:00	S110
D106	Joseph Macho	P105	Teresia Anyango	14-sep-22	13:30	S115
D106	Joseph Macho	P110	Denzel Wambua	15-sep-22	17:30	S113

QUESTION FIVE (15 Marks)

You are a database designer and a car race company approaches you to help them build a database from design to implementation.

Requirements:

- We have cars, for each car we keep its VIN number (unique ID), engine type, color, make, and model
- We have drivers, for each driver we keep ID (unique), name, DoB, and age (derived attribute)
- Drivers use cars to enter races, each race has some attributes such as the race number (unique ID), race type, the number of rounds, and date.
- Each driver can enter many races and can use the same car or different one in each race. Thus the same car can participate in many races.

- In the design, we want to capture which car is used by which driver and in which race.
- We also need to capture the winner of each race (the driver who won the race) and the winning time (the time taken to finish and win the race).

Required:

- i) What do you understand by the term Entity as used in database design? **(2 Marks)**
- ii) From the requirements narrative above, identify **ALL** the entities as well as attributes for each of the entities **(4 Marks)**
- iii) Select any two entities and explain the **TYPE** or relationship between them. Write down your assumption if any. **(3 Marks)**
- iv) Using the entities and attributes identified in (ii) above, draw a ER- Diagram to clearly capture the requirements in the narrative above. Write down your assumptions and indicate all entity relationship cardinality. (Use Crow's foot notation). **(6 Marks)**