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

DATE: 21st March 2025 **Time:** 11.00 - 13.00

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) 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 **(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 as defined in Transactional Management and concurrency control. **(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 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 FOUR (15 Marks)

a) Using the table below explain **THREE** anomalies that can occur in databases. Use an example 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)

Staff_No	Dentist_Name	Patient No	PatientName	Appointment		SurgeryNo
				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)**