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CICT PART II SECTION 3

DATABASE SYSTEMS

WEDNESDAY: 1 September 2021.

Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question.

QUESTION ONE

- (a) Differentiate between each of the following pair of terms as used in database systems.
- (i) "Entity set" and "relationship set". (2 marks)
  - (ii) "Weak entity set" and "strong entity set". (2 marks)
- (b) In a motor show, a car is uniquely identified by its registration number. The registration number is composed of the state the car was registered and enrolment number. Internationally, a car is uniquely identified by its vehicle identification number. The motor show agent also captures the year in which the car was manufactured, its model and make.
- Required:**
- (i) Draw an Entity Relationship (ER) diagram representing the above scenario. (4 marks)
  - (ii) Write Structured Query Language (SQL) that would create a table with the above details. (4 marks)
  - (iii) Write SQL statements that would produce records of cars manufactured between 2013 and 2014 and painted black. The records should be arranged in ascending order. (3 marks)
  - (iv) Write SQL statements that would retrieve records of latest cars in terms of the year of manufacture. (3 marks)
  - (v) Write a relational algebra statement that would list records of all cars painted white in colour. (2 marks)
- (Total: 20 marks)**

QUESTION TWO

- (a) Explain the following terminologies as used in database systems:
- (i) Instance. (2 marks)
  - (ii) Schema. (2 marks)
- (b) Consider the following entity used to store information about animals in a vet clinic:
- tblpet = {petid, petname, year\_of\_birth, age}
- Required:**  
Write a relational algebra statement to display:
- (i) All the pets that are more than five years old. (2 marks)
  - (ii) The petid, petname and age. (2 marks)
- (c) Citing an example in each case, describe the implementation of two group functions in database systems. (6 marks)
- (d) Illustrate a simple architecture of a data warehouse showing the relationship between data source and data users. (6 marks)
- (Total: 20 marks)**

### QUESTION THREE

(a) Explain the following categories of data types as used in databases:

- (i) LOB types. (2 marks)
- (ii) Reference types. (2 marks)
- (iii) Scalar types. (2 marks)

(b) Graph databases is an emerging trend in database systems.

Describe the term "graph databases". (2 marks)

- (c) (i) Explain why database security is a core consideration when adopting database application for your organisation. (2 marks)
- (ii) Discuss three computer-based controls that could be used as counter measures against an attack of a database system. (6 marks)

(d) Data integrity refers to the trustworthiness of data throughout its lifecycle.

**Required:**

- (i) Highlight two ways of preserving data integrity. (2 marks)
- (ii) State two common threats that could alter the "state of data integrity". (2 marks)

(Total: 20 marks)

### QUESTION FOUR

(a) Explain the following terms in the context of databases:

- (i) Replication server. (2 marks)
- (ii) Buffer manager. (2 marks)

(b) Use the sales order table below in answering questions that follow:

SALES ORDER				
XYZ Enterprises Ltd. P O Box 0001 Mombasa				
Customer Number: 1003		Order No.: 404		
Customer Name: XYZ		Order Date: 31/5/2021		
Customer Address: P O Box 01 Nairobi		Clerk No.: 102		
		Clerk Name: Peter		
Item No.	Description	Quantity	Unit price (Sh.)	Amount (Sh.)
800	Trouser	40	2000	80,000
801	Shirt	20	1000	20,000
			<b>Total</b>	<b>100,000</b>

**Required:**

- (i) Citing a reason, identify two items of information that would not qualify as an attribute in a relation/table used to store the above data. (4 marks)
- (ii) Normalise the table data to Third Normal Form (3NF). (6 marks)
- (c) Outline four disadvantages of mobile databases. (4 marks)
- (d) Differentiate between "concurrency control" and "logging recovery manager". (2 marks)

(Total: 20 marks)

**QUESTION FIVE**

(a) The table below shows an extract of data obtained from XYZ College:

Reg. No.	SName	Email	Number of units	Fee paid (Sh)	Age
P52-0300/2014	John	joe@gmail.com	52	480,000.00	35
P58-0100/2000	Peter	petro@yahoo.com	12	200,000.00	38
P52-0302/2014	Rose	rossy@gmail.com	49	412,000.00	22
P32-0101/2002	Carol	carol@gmail.com	16	265,000.00	30
P53-0334/2015	Sam	sammy@gmail.com	35	385,000.00	25

**Required:**

Citing an example from the above table, define:

- (i) Cardinality. (2 marks)
- (ii) Arity. (2 marks)
- (b) Construct a schema using the above table. (4 marks)
- (c) Differentiate between a primary key and a foreign key. (4 marks)
- (d) Citing two reasons, justify why web-based databases offer a significant opportunity to distribute data to organisations. (4 marks)
- (e) Using an illustration, describe data independence as used in distributed databases. (4 marks)

(Total: 20 marks)

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