DATABASE MANAGEMENT SYSTEMS
November 2018
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE II

DATABASE MANAGEMENT SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

*This paper consists of **EIGHT** questions.*
*Answer any **FIVE** questions in the answer booklet provided.*
***ALL** questions carry equal marks.*
Candidates should answer the questions in English.

This paper consists of 5 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) Outline **four** characteristics of a Database Management System. (4 marks)

(b) Explain the Three-Schema Architecture of a Database Management System. (4 marks)

(c) (i) Outline **two** threats to data stored in a Database Management System (2 marks)

(ii) A newly established manufacturing company intends to design a database from scratch. State **four** relational database languages they could use. (4 marks)

(d) With the aid of an appropriate symbol, explain each of the following components of an Entity- Relationship Diagram (ERD):

(i) entity;

(ii) relationship;

(iii) attribute. (6 marks)

2. (a) Outline **three** duties of a Database Administrator (3 marks)

(b) Explain each of the following types of database architectures:

(i) Client Server;

(ii) Distributed. (4 marks)

(c) With the aid of examples in each case, distinguish between Data Definition Language (DDL) and Data Manipulation Language (DML). (6 marks)

(d) During a database maintenance session, it was discovered that the Data dictionary had malfunctioned.

(i) Explain **two** functions of this dictionary in a Database. (4 marks)

(ii) State **three** Components of this dictionary. (3 marks)

3. (a) Outline **three** properties of a relational table. (3 marks)

(b) A company intends to integrate its Database Management System.
Explain **three** structural components that may be considered. (6 marks)

(c) Differentiate between *superkey* and *candidate key* as used in Database management systems. (4 marks)

(d) (i) Describe the object oriented database model. (4 marks)

(ii) An ICT Technician intends to perform database recovery procedures from the Enterprise's backup. State **three** types of backup that he may use in the recovery process. (3 marks)

4. (a) Define each of the following terms as used in the Entity-Relationship Modelling:

(i) specialisation;

(ii) aggregation. (4 marks)

(b) With the aid of an example in each case, distinguish between *composite* and *derived* attributes. (4 marks)

(c) Explain each of the following terms as used in relational databases:

(i) Cardinality ratio;

(ii) Participation constraint. (4 marks)

(d) The following narrative is a representation of information about banks. Use it to answer the questions that follow

- There are multiple banks and each bank has many branches. Each branch has Multiple customers.
- Customer has a name, address that consists of house number, area and city, and one or more phone numbers.
- Customers have various types of accounts.
- Some Customers also had taken different types of loans from these bank branches.
- Account has number, type and balance.
- One customer can have multiple accounts and Loans.

(i) Identify **four** Entities in the narrative. (2 marks)

(ii) Draw an Entity-Relationship Diagram to represent the information. (6 marks)

5. (a) Outline **three** characteristics of the First Normal Form (1NF). (3 marks)

(b) Explain each of the following types of anomalies in Normalization:

(i) Update;

(ii) Deletion. (4 marks)

(c) Table 1 shows information contained in a database table. Use it to answer the questions that follow:

roll_no	Name	Subject
101	John	OS, CN
103	Jeremy	Java
102	Jacob	C, C++

Table 1

Normalize the table up to the second normal form (2NF). (7 marks)

(d) (i) Peter designed a Database Management System using a relational Model. Outline **three** challenges that he may have encountered during the design. (3 marks)

(ii) State **three** database schemas he may have used. (3 marks)

6. (a) Outline **four** trends in database technology. (4 marks)

(b) Explain the referential Integrity rule. (2 marks)

(c) Peter has been tasked to design a database by following the database design life cycle.

(i) Explain the conceptual modelling stage of this life cycle. (2 marks)

(ii) Outline **four** advantages of the model in (i) (4 marks)

(d) Table 2 and table 3 shows fruits and snacks respectively available at different Kiosks. Use them to answer the questions that follow:

FRUIT

Fruit code	A	B	C
F01	1	2	3
F02	4	5	6
F03	7	8	9

Table 2

SNACK

Snack code	B	C	D
S01	2	3	10
S02	2	3	11
S03	6	7	12

Table 3

Compute

(i) $\Pi_{A,C}(\text{FRUIT})$;

(ii) $\sigma_{B=2}(\text{SNACK})$;

(iii) Natural join;

(iv) Outer join. (8 marks)

7. (a) Outline **two** uses of database systems in hotel industry. (2 marks)

(b) Distinguish between *weak* and *strong* entities. (4 marks)

(c) A database has been scheduled to run an automatic update on a daily basis. Explain **three** types of integrity constraints that must be checked during update operation. (6 marks)