THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE II

DATABASE MANAGEMENT SYSTEM

3 hours

INSTRUCTIONS TO CANDIDATES

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

Turn over

1. (a) Describe **three** types of Database Management System users. (6 marks)

(b) With the aid of an example in each case, distinguish between *physical* and *logical* data independence as used in database design. (4 marks)

(c) Table 1 shows information from a *booksDetails* relation in a relational database. Use it to answer the questions that follow.

Table 1

Book_Id	BookTitle	BookAuthor
B2233	The Worlds Deity	Maxwell
B2234	Making Money Online	Havi
B2235	Database Made Easy	Charles

Write a Structured Query Language statement that would:

(i) display the authors of books from the booksDetails relation whose *Book_Id* is greater than or equal to B2235, (2 marks)

(ii) add a new record; *B2236, Database Applications, Peter into the relation*, (2 marks)

(iii) remove the book titled *The Worlds Deity* from the relation; (2 marks)

(iv) sort the table by Book_Id in descending order; (2 marks)

(v) display the total number of books authored by *Havi* in the relation. (2 marks)

2. (a) (i) Explain the term *schema* as used in the Database Management Systems. (2 marks)

(ii) With the aid of a diagram, explain the **two** categories of database schema as used in database design. (6 marks)

(b) Distinguish between *distributed* architecture and *client/server* architecture as used in Database Management Systems. (4 marks)

(c) In a college, a student is identified by admission number, names which consists of the first and the second name, date of birth and age which is derived from the date of birth, their phone numbers which include that of the guardian. Each student belongs to a class which is identified by a class name. Students are free to register in one or more clubs. Each club is identified by a club name and club identification code.

Represent the information using an entity relationship diagram. (8 marks)

3. (a) Outline the function of each of the following constraint as used in Structured Query Language.

(i) UNIQUE ; (1 mark)

(ii) CHECK; (1 mark)

(iii) DEFAULT. (1 mark)

(b) In the early years of computing, punched cards were used for storing and retrieving data. Outline **four** challenges that could have been realised from using these devices.

(4 marks)

(c) Explain **three** factors that may influence the choice of database system in an organisation.

(6 marks)

(d) Table 2 is the un-normalised table used by a movie vendor to manage their movie distribution. Normalise the table up to the *third normal form*.

(7 marks)

Table 2

NAME	PHYSICAL ADDRESS	MOVIE TITLE	TITLE
Jean Zani	Mashujaa Road	The Life of a Politician, Bits and Bytes of Computers	Ms.
Sam Lemi	Nairobi East Ways	The Valley of Life, Cutting the Roses	Mr.
Sam Lemi	HillsView way	Bits and Bytes of Computers	Mr.

4 (a) Outline **four** Data Definition Language statements used in Structured Query Language.

(4 marks)

(b) Explain **three** characteristics of relational databases

(6 marks)

(c) Distinguish between *domain constrain* and *referential integrity* constraint as used in database design.

(4 marks)

(d) A database has a relation named *StudentsDetails* with fields: *Names*, *AdNumber* and *Class*.

(i) Explain the output from each of the following algebraic expression from the relation:

I. $\delta_{AdNumber = "1145" and Class = "4W"}$ (StudentsDetails)

II. $\Pi_{Name, Class}$ (StudentsDetails)

(4 marks)

(ii) Write the algebraic expression for the Structured Query Language statement:

(2 marks)

```
select count(salary)
from StudentsDetails;
```

5 (a) Outline the meaning of each of the following terms as used in databases:

(i) domain;

(ii) attribute;

(iii) entity set.

(3 marks)

(b) Explain each of the following relational algebra statements used in database.

(i) set difference.

(2 marks)

(ii) Cartesian product.

(2 marks)

(c) (i) Distinguish between *generalisation* and *specialisation* as used in entity relationship diagrams. (4 marks)

(ii) With the aid of an example, explain the term *functional dependency* as used in database normalisation. (3 marks)

(d) A company with branches in different cities opted to use a distributed database system to manage their data. Explain **three** benefits that the company will gain from this approach. (6 marks)

6 (a) Outline **four** states of transactions in a database management system. (4 marks)

(b) Explain a circumstance under which each of the following anomalies may occur in un normalised database:

(i) update; (2 marks)

(ii) deletion; (2 marks)

(iii) insert. (2 marks)

(c) Explain the term *data replication* as used in Database Management system. (2 marks)

(d) A company's database experienced system failure.

(i) Explain **two** recovery techniques in which the company should have used in order to recover the data. (4 marks)

(ii) During the recovery, there was a transaction failure. Explain a reason that may have caused each of the following types of errors.

I. Logical errors;

II. System errors. (4 marks)

7 (a) Explain a circumstance under which a database transaction may achieve each of following properties:

(i) atomicity; (2 marks)

(ii) consistency; (2 marks)

(iii) isolation. (2 marks)

(b) Distinguish between a *union* and a *rename* operators as used in relational algebra' (4 marks)

(c) The following are two relations in a database named *Persons* and *Orders*. Use the information to answer the questions that follows.

Persons table

P_Id	LastName	FirstName	Address	City
1	James	Katute	15 Streets	Nairobi
2	Smith	Nekesa	10 avenue	Nairobi
3	Kristen	Oliya	Makuba street	Kiambu

Orders table

O_Id	OrderNo	P_Id
1	77895	2
3	22456	2
4	24562	1

(i) With the aid of an example from the table, explain the *foreign key* constraint in a database. (3 marks)

(ii) Write a Structured Query Language statement to:

I. create the orders table with all its constraints; (4 marks)

II. display all the records of the fields *P_Id, LastName*, and *OrderNo*. (3 marks)

(a) Outline **four** advantages of using views in a database. (4 marks)

(b) Describe **two** components of a database. (4 marks)

(c) A programmer opted to create an application that used *file system* as a means of storing data. Explain **three** challenges that the system is likely to experience from using this approach. (6 marks)

(d) The following is an extract of a relation named *customers* in a database. Use it to answer the questions that follow.

CustId	SecondName	Contact	Town
C001	Alfred Lokone	07994692	Lodwar
C002	Annette Onyango	07884525	Kisumu
C003	Moreno Kanene	07994464	Nairobi
C004	Wendi Wakio	07894730	Mombasa

Write a Structured Query Language statement that would display

(i) the number of distinct towns in the table; (2 marks)

(ii) all records whose *Contact* contains the pattern "44"; (2 marks)

(iii) all records with *SecondName* not starting with letter "K", or "O". (2 marks)

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