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 **FIVE** of the following **EIGHT** questions in the answer booklet provided.*
All questions carry equal marks.
Candidates should answer the questions in English

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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** roles of a database architect. (4 marks)✓

(b) Taxan Bank uses a file based approach in its operations. Outline **four** limitations of this approach. (4 marks)✓

(c) Describe **three** components of a database. (6 marks)✓

(d) With the aid of a diagram, describe the client-server database architecture. (6 marks)✓

2. ✓ (a) Define each of the following terms as used in database management system:

(i) entity; ✓

(ii) attribute. ✓ (4 marks)

(b) Chema SACCO intends to undertake requirements gathering for its database. Explain **three** types of requirements that could be gathered. (4 marks)

(c) With the aid of a diagram describe the *network* database model. (6 marks)

(d) Explain each of the following terms as used in cloud computing database technology:

(i) standardization; (2 marks)

(ii) virtualization; (2 marks)

(iii) automation. (2 marks)

3. (a) Define each of the following terms as used in databases:

(i) schema; ✓ (2 marks)

(ii) tuple; (2 marks)

(iii) relation. (2 marks)

(b) Outline **four** characteristics of a relational database domain. (4 marks)

(c) Distinguish between *degree* and *cardinality* as used in relational databases. (4 marks)

(d) Patrand added constraints to a relational database during a practical lesson. Explain **three** constraints she could have added. (6 marks)

4. ✓ (a) Explain each of the following terms as used in databases.
✓
(i) data independence; (2 marks)

(ii) database instance. (2 marks)✓

(b) With the aid of a diagram in each case, distinguish between *two-tier* and *three-tier* database architectures. (6 marks)✗

(c) Explain each of the following phases of a database development life cycle:

(i) requirements analysis; (2 marks)✓

(ii) conceptual database design; (2 marks)✓

(iii) logical database design. (2 marks)✓

(d) Table 1 shows the attributes used to create a relation named TAXPAYER. Use it to answer the question that follows.

Field	Code	Title	Allowance	TaxRate
Data type	integer	VarChar	currency	float
size	4	20	8	3

Table 1

Write SQL statements to create the relation. (4 marks) ✓

5. (a) Outline **four** advantages of using entity relationship diagrams in database design. (4 marks) ✓

(b) Outline **three** differences between *strong* and *weak* entities as used in database modelling. (6 marks) ✓

(c) Explain each of the following terms as used in entity relationship diagrams:

(i) Candidate key; (2 marks)

(ii) derived attribute. (2 marks)

(d) The following is a database schema. Use it to answer the questions that follows

STUDENT (STUDENTID, STUDENTNAME);
COURSE (COURSEID, COURSENAME);
LECTURER (LECTURERID, LECTURERNAME);

- A student is assigned a course
- A Lecturer delivers a course
- A student can be assigned multiple courses
- A Lecturer can deliver only one course

Draw an entity relationship diagram (ERD) for the database. (6 marks) ✓

6. (a) Outline **four** properties of a relation in First Normal Form (1NF) (4 marks) .

(b) Explain each of the following terms as used in database:

(i) decomposition;

(ii) update anomaly* (4 marks)

(c) Differentiate between *functional* and *trivial* dependenciesas used in normalization. (4marks)

(d) Table 2 shows data in an unnormalised form. Use it to answer the question that follows.

Movie_Title	Year	Type	Director	Director_DOB	Yr_releases_cnt	Actors
Notting	1999	Romantic	Rogers M.	05/06/1956	30	Hugh G Rhys
Lagaan	2000	Drama	Ashutosh G.	15/02/1968	50	Aamir K Gracy S

Table 2

Normalise the table to 2NF. (8 marks)

7. (a) Distinguish between *schedule* and *serializability* as used in database transactions.
(4 marks)

(b) Drake, a database administrator, has been tasked with implementing concurrency control in the company database system. Outline **five** benefits of this control. (5 marks)

(c) With the aid of a venn diagram, explain the intersection operation as used in relational algebra. (4 marks)

(d) Tables 3 shows a database relation named Customer. Use it to answer the questions that follows.

CustomerID	CustomerName	Status
1	George	Active
2	Ann	Active
3	Andrew	Inactive
4	Mary	Active

Table 3

Draw the relation for the expression:

(i) $\Pi_{CustomerName, Status}$ (Customers) (4 marks)

(ii) $\alpha_{CustomerID, CustomerName(Where Status=Active)}$(Customers) (3 marks)

8. (a) John, a database administrator, created an account for a user. Explain **two** previleges that the user may be granted. (4 marks)

(b) A student has been asked to analyse the process of transaction execution in a database. Explain each of the following database transaction states that he may have analysed:

(i) atomicity; (2 marks)

(ii) consistency; (2 marks)

(iii) isolation. (2 marks)

(c)   With the aid of an SQL statement in each case, explain the following commands;

(i)   insert;   (2 marks)

(ii)   select.   (2 marks)

(d)   The following datatypes were used in a database table.

(i)   Float;

(ii)   Varchar;

(iii)   Text.

Describe each of the datatypes.   (6 marks)

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