

2920/206  
DATABASE MANAGEMENT SYSTEM  
July 2018  
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY  
MODULE II  
DATABASE MANAGEMENT SYSTEM

3 hours

**INSTRUCTION TO CANDIDATES**

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

**This paper consists of 6 printed pages.**

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

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**Turn over**

- (a) Explain how a Database Management Systems accomplishes each of the following: (6 marks)
- (i) Security management; *passwords*
  - (ii) Multi-User Access Control; *concurrent access*
  - (iii) Data Integrate Management. *Data redundancy - some copy of data in different locations*
- (b) The earliest business computer systems used to store groups of records in a single file. Explain **three** challenges of this type of approach. (6 marks)
- (c) Figure 1 shows a database tier architecture. Use it to answer the questions that follow.

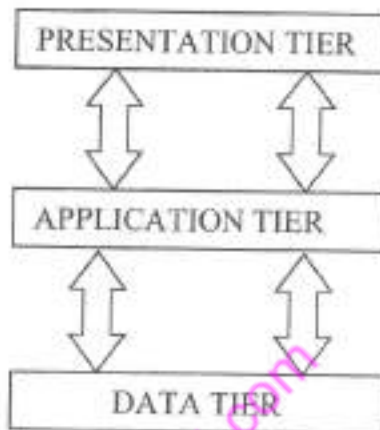


Figure 1

- (i) Identify the architecture. *3 tier database architecture* (2 marks)
- (ii) Explain **three** benefits of this type of tier architecture in a database. (6 marks)  
*Result to well developed applications*  
*Secure database architecture*
- (a) Describe the classification of databases based on each of the following criteria: (6 marks)
- (i) number of users; *Single user*  
*Multiuser*
  - (ii) location. *Distributed*  
*Centralized* *→ Data stored at a centralized database*
- (b) Distinguish between *internal* and *external* schema as used in database design. (4 marks)

*Schema - structure of a database in terms of tables*  
*internal logical structure of a DB*

- (c) The following is a table named hostelworkers in a database. Use it to answer the questions that follow. (10 marks)

ID	NAME	HOSTEL	AGE	SALARY	YEARS OF SERVICE
500	Patrick	Red	44	22000	7
510	Dolly	Blue	30	45000	15
520	Sindy	Orange	35	26000	10
530	Lucy	Green	20	44000	12

Write an SQL statement that would:

- Sort the hostel table by the name and salary in descending order;
- Find the average salary for all employees; *SELECT AVG(SALARY) FROM hostelworkers*
- Find salary more than twenty one thousand and less than thirty thousand and in red hostel; *SELECT (SALARY > 20,000 AND < 30,000)*
- Display all the records having names with letters "dy"; *WHERE HOSTEL = "Red"*
- Increase salary for all employees by 5%. *FROM hostelworkers*

- (a) Outline the function of each of the following SQL commands: (4 marks)

- IN operator;
- Exists;
- Unique;
- Not.

*SELECT SALARY BETWEEN "20,000 AND 30"  
WHERE HOSTEL = "Red" FROM  
hostelworkers*

- (b) Explain **three** routine maintenance jobs that can be carried by a database administrator in an organisation. *Privileges/Rights to modify systems* (6 marks)

- (c) Distinguish between *system privileges* and *object privileges* as used in SQL. (4 marks)

*=> Rights to modify objects and SQL*

- (d) Describe each of the following modules that operate in a database system: (6 marks)

- Transaction manager;
- Recovery manager;
- Cache manager;

- 4 (a) Outline **three** rules to be observed when creating sub queries in SQL. (3 marks)
- (b) Distinguish between a *schema* and an *instance* as used in databases. (4 marks)
- (c) The goal of abstraction in the DBMS is to separate the user's request and the physical storage of data in the database. Describe **three** levels of abstraction that can perform these goals in a database. (6 marks)

(d) A car company dealing with importation of cars on behalf of clients is based in Mombasa. Shipped vehicles are characterized by; unique car identification number, car weight, car type, destination, and delivery date.

Shipped vehicles are received at the company go-downs. Each go-down is characterized by; a unique go-down id, location and telephone number. Shipped vehicles make their way to their clients via standard gauge railways or by road.

Each client is characterised by; a unique client id, clients name, address and the types of transport used to deliver the cargo.

Draw an entity relationship diagram for the above information. (7 marks)

- 5 (a) (i) Explain the function of each of the following components of a database management system: (4 marks)
- (I) Procedures;
- (II) Database Engine.
- (ii) Write the SQL statements equivalent to each of the following relational algebra statements. (4 marks)
- (I)  $a, b \cdot (d > e) \wedge (f = g)^{(p, q)}$
- (II)  $a \cap b$
- (b) Outline **four** types of procedures that one would require to help operate and manage a DBMS. (4 marks)
- (c) State **two** differences between *relational algebra* and *relational calculus*. (4 marks)
- (d) Describe **two** query languages that can be used by an application developer in a database. (4 marks)
- 6 (a) State **two** wildcard operators that can be used in conjunction with a Like statement in SQL. (2 marks)
- (b) Outline **four** SQL statements that can be used to define a database structure. (4 marks)

(c) Describe each of the following terms as used in SQL: (6 marks)

- (i) Primary key;
- (ii) View;
- (iii) Nested query.

*Include info from database*

(d) The following are tables created in a database. Use them to answer the questions that follow:

**Table A**

id	common	name
1	AMERICA	NAME 1
2	BARATON	NAME 2

*Left*

id	common	name	TITLE
1	AMERICA	NAME 1	TITLE 1
2	BARATON	NAME 2	TITLE 2

**TABLE B**

ID	COMMON	TITLE
1	BARRY	TITLE 1
2	CALI	TITLE 2

id	common	name	COMMON	TITLE
1	AMERICA	NAME 1	BARRY	TITLE 1
2	BARATON	NAME 2	CALI	TITLE 2

State the fields that would be generated when each of the following relational algebra operations are performed on the tables. (8 marks)

(i) Inner join A and B;



ID	COMMON	TITLE
1	BARRY	TITLE 1
2	CALI	TITLE 2
NULL	AMERICA	NULL
NULL	BARATON	NULL

(ii) Left outer Join A and B;



(iii) Right outer Join A and B;



(iv) Full outer Join A and B.



(a) Describe *denormalisation* as used in databases. (2 marks)

(b) A database administrator experienced a system failure as he was using a database management system. Explain three likely causes of this failure. (6 marks)

(c) With the aid of an example, distinguish between a *composite attribute* and a *derived attribute* as used in ER diagrams. (6 marks)

(d) Anne would like to model some database operations using laws in relational algebra. Describe two laws that would enable her meet her goals giving an example in each case. (6 marks)

- 8 (a) Outline **four** advantages of client server architecture as used in databases. (4 marks)
- (b) (i) Explain the term concurrency control as used in databases. (2 marks)
- (ii) Distinguish between *read phase* and *write phase* as used in concurrency control phase validation in a database. (4 marks)
- (c) A learning institution maintains details of its lecturers who are teaching various units as follows:
- Lecturer no, lecturer name, grade, code, department name, subject code, subject name, subject level.
- Each lecturer may teach many subjects but may not belong to more than one department.
- Normalise this data to 3<sup>rd</sup> normal form. (10 marks)

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