

2920/206  
DATABASE MANAGEMENT SYSTEMS  
July 2022  
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 FIVE of the EIGHT questions in the answer booklet provided.  
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.**

save time & reduce  
easy to debug

1. (a) Outline **four** advantages of database systems. (4 marks)
  - (b) Explain each of the following phases of database design:
    - (i) database planning; (2 marks)
    - (ii) requirement analysis; (2 marks)
    - (iii) physical design. (2 marks)
  - (c) With the aid of a symbol in each case, describe the following terms as used in entity relationship modelling:
    - (i) entity set; (2 marks)
    - (ii) attribute. (2 marks)
  - (d) Write an SQL statement for each of the following relational algebra expressions:
    - (i)  $\pi_{\text{Name}}(\sigma_{\text{Salary} > 10000}(\text{Staff}))$  (3 marks)
    - (ii)  $\sigma_{\text{Position} = \text{'Manager'}}(\text{Staff})$  (3 marks)
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2. (a) (i) Outline **two** soft skills that a database administrator should possess. (2 marks)
  - (ii) Outline **four** functions of a server in a client - server architecture. (4 marks)
  - (b) Describe each of the following database backup methods:
    - (i) full; (2 marks)
    - (ii) incremental. (2 marks)
  - (c) Distinguish between *full* and *partial* functional dependencies as used in database normalization. (4 marks)
  - (d) Study the following narration and answer the question that follows.

A doctor in a hospital treats many patients. A patient is identified with a unique patient number. A patient can be either an inpatient or an outpatient. An inpatient is assigned a ward with a specific ward name and number. An outpatient is prescribed one or many drugs which are issued after paying to a cashier.

Represent this information in an entity relationship diagram. (6 marks)
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3. (a) Explain **two** advantages of data warehousing. (4 marks)
  - (b) Paul was hired to coordinate a database project which failed before the completion time. Explain **three** reasons that could have caused this failure. (6 marks)
  - (c) Differentiate between *form* and *report* as used in databases. (4 marks)
  - (d) With the aid of a syntax, describe each of the following clauses as used in SQL:
    - (i) IN; (3 marks)
    - (ii) BETWEEN. (3 marks)

4. (a) Explain the term data independence as used in a database. (2 marks)
- (b) Describe **three** generations of database systems. (6 marks)
- (c) Distinguish between *schema* and *instance* as used in databases. (4 marks)
- (d) Table 1 shows details of hotel booking in a database system. Use it to answer the questions that follow.

GuestNo	HotelNo	HotelName	GuestName	Address	Date
G102	H101	Tiger	Tony	44, LTO	11/09/18
G105	H103	Cheetah	Simon	356, NKU	18/09/18
G107	H101	Tiger	Dave	23, MBA	21/10/18
G108	H104	Leopard	Deon	457, MTI	25/11/18

Table 1

- (i) Normalize the data in the table to 2NF. (5 marks)
- (ii) Outline **three** anomalies eliminated by normalization. (3 marks)
5. (a) Explain each of the following terms as applied in database systems security:
- (i) discretionary access control; (2 marks)
- (ii) view. (2 marks)
- (b) Dave, a computer student would like to decompose a database table using bottom up approach:
- (i) State the most appropriate technique that he could use; (1 mark)
- (ii) Explain **two** circumstances that could have necessitated the use of this approach. (4 marks)
- (c) Table 2 table shows details of departments in an organization. Use it to answer the questions that follow.

DeptNo	DeptName	DeptHead	Location
HRM202	Human Resource	HR Manager	Nairobi
FNC101	Finance	Finance Manager	Kisumu
OP304	Operations	Operations Manager	Mombasa

Table 2

- (i) Write an SQL statement to add the following record. (4 marks)
- | DeptNo | DeptName | DeptHead       | Location |
|--------|----------|----------------|----------|
| WF100  | Welfare  | Social Manager | Nairobi  |



- (ii) Write the output displayed when the following relational algebra statement is executed after adding the record in (i).

$\sigma_{\text{Location} = \text{'Nairobi'}}(\text{Department})$  (3 marks)

- (iii) John wrote the following SQL statement but it could not execute.

```
SELECT DepartmentName, DepartmentHead
FROM = Dept,
WHERE DepartmentNo FN101 AND location is Kisumu;
```

Rewrite the statement correctly. (4 marks)

6. (a) Outline four advantages of levels in a tiered database architecture. (4 marks)
- (b) With the aid of a diagram, describe network database model. (4 marks)
- (c) Differentiate between *composite* and *alternate* keys as used in relational databases. (4 marks)
- (d) The following two tables; R1 AND R2 show details of student and sport respectively. Use them to answer the question that follows.

StudNo	StudName	Grade	Age
P53	Moses	4	10
S14	Mark	6	12
D27	Martha	5	11

R1

StudNo	SportNo	SportDate
S14	1004	11/01/2010
D27	1007	04/02/2012
P54	1003	09/02/2010

R2

Write the output generated when each of the following operation is executed:

- (i)  $R1 \bowtie R2$ ; (2 marks)
- (ii)  $R1 \Join R2$ ; (3 marks)
- (iii)  $R1 \ltimes R2$ . (3 marks)

7. (a) Distinguish between *cascade* and *restrict* commands as used in database views. (4 marks)
- (b) With aid of a diagram, describe thin client server architecture. (5 marks)
- (c) The following two tables; Customer and Plot, show details of customers and plots respectively. Use them to answer the question that follows.

CustomerNo	CustomerName	Address
C124	Mike Dike	144, Diani
C446	Jane Nile	356, Maputo
C270	Rita Damian	431, Kile

Customer

PlotNo	CustomerNo	Location	Price
E1001	C124	Embu	400,000
E1010	C446	Embu	540,000
N2008	C270	Nairobi	790,000
K2004	C446	Kitui	250,000

Plot

Write an SQL statements to:

- (i) create the table named Customer; (3 marks)
- (ii) create a foreign key constraint in Plot table to reference Customer table; (2 marks)
- (iii) extract plot details for all plots whose price is greater than 500,000; (3 marks)
- (iv) extract the CustomerName and PlotNo for all customers whose location is Embu. (3 marks)

8. (a) State two quantifiers used in relational calculus. (2 marks)
- (b) (i) Explain the term closure as used in relational algebra. (2 marks)
- (ii) With the aid of a Venn diagram, describe union operation as used in relational algebra. (4 marks)
- (c) Distinguish between *master file* and *transaction file* as used in databases. (4 marks)
- (d) Table 3 shows the output of a full join performed on two tables; *Customer* and *Branch*. Use it answer the question that follows.

AccountNo	CustName	CustAddress	BranchId	BranchName
B01011	Faith	432, Mndr	M002	Mandera
B01012	Fred	444, Trkn	N200	Null
Null	Null	Null	V302	Voi
B01110	Fenesi	22Kti	K312	Null
B01000	Saulo	45, Kmg	T020	Kakamega

Table 3

Extract the two tables prior to the join.

(8 marks)

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