2920/206
DATABASE MANAGEMENT SYSTEM
November 2017
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION TECHNOLOGY

MODULE II

DATABASE MANAGEMENT SYSTEM

3 hours

INSTRUCTIONS TO CANDIDATES

Answer any **FIVE** *of the following* **EIGHT** *questions in the answer booklet provided.*
All questions carry equal marks.
Candidates to 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

1. (a) Explain each of the following terms as used in databases. (4 marks)

    (i) Data Definition Language.

    (ii) Database Catalogue.

(b) Table 1 is an extract from a database. Use it to answer the questions that follow.

| NationalID	FarmerName	Age	Bonus
F00801	Agnes	25	20000
F00679	Catherine	45	75000
F00558	Gladys	55	35000
F00896	John	22	15000
F00725	Alex	38	25000

Table 1: Farmer

Write an algebraic expression to:

    (i) display the *NationalID*, *FarmerName* for all farmers who earn a bonus of less than 25,000; (3 marks)

    (ii) rename the table *Farmer* to *FarmerDetail*, the columns *NationalID* to *ID* and *Farmername* to *Fname*; (3 marks)

    (iii) display the average bonus earned by the farmers. (2 marks)

(c) Explain **two** circumstances that may prompt an organisation to implement a centralised database. (4 marks)

(d) Distinguish between *one to one* and *one to many* cardinality as used in databases. (4 marks)

2. (a) State the database users who perform each of the following tasks: (2 marks)

    (i) Interacts with database systems without writing programs;

    (ii) Interacts with database systems through previously created programs.

(b) Study the following narrative and use it to answer the questions that follow.

> *A car insurance company has customers. The customer can be identified by, the identification number, name and location. The customer can own one or more cars and can buy one or more Insurance premiums. Each car has been associated with one or more accidents. A car can be identified by the registration number, model and capacity.*

Represent the information in an ER diagram. (6 marks)

(c) Explain **two** limitations of the file-based database approach. (4 marks)

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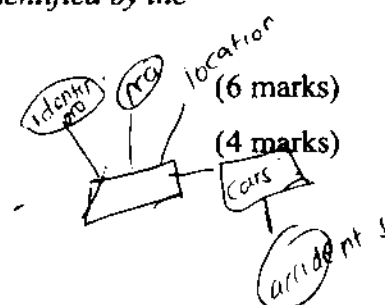
d) (i) Distinguish between *commit* and *rollback* statements as used in SQL. (4 marks)

(ii) Explain the use of each of the following SQL statements: (4 marks)

(I) Drop table Users Restrict;

(II) Drop table Users Cascade.

3. (a) Explain each of the following terms as used in distributed database systems: (4 marks)

(i) partitioned tables;

(ii) replicated tables.

(b) With the aid of an example, distinguish between the terms *relation* and *relation schema* as used in databases. (4 marks)

(c) John, a database administrator has been experiencing challenges manipulating data stored in a database. Explain **three** ways in which data normalization can resolve some of the challenges. (6 marks)

(d) (i) Outline the function of the *cartesian product* as used in algebraic expressions. (2 marks)

(ii) Write the equivalent algebraic expression for each of the following tuple calculus expressions: (4 marks)

(I) $\{t \mid \exists q \in r(q[A] = t[A])\}$

(II) $\{t \mid t \in r \wedge t[B] = 17\}$

4. (a) Define the term *file server* as used in a client server database. (2 marks)

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

(c) Table 2 is an Employee table represented in 1NF. Use it to answer the questions that follow.

EmployeeID	Contract No	Hours	Employee Name	Company ID	Company Location
616681B	SC1025	72	P. White	SC115	Nairobi
674315A	SC1025	48	R. Press	SC115	Nairobi
323113B	SC1026	24	P. Smith	SC23	Nairobi
616681B	SC1026	24	P. White	SC23	Nairobi

Table 2: Employee

Represent the table in its 3NF. (8 marks)

(d) Using an example in each case, explain the following operators as used in relational algebra: (6 marks)

(i) union;

(ii) intersection.

(iii) difference.

5. (a) Distinguish between the *physical* and *logical* stages of the database life cycle. (4 marks)

(b) Explain **two** functions of the *Database Administrator* in a database environment. (4 marks)
→ manage accessibility of data
→ sharing of data

(c) (i) Explain the use of Grant Select on projects to User1;SQL statement when applied in a database. Selects the entire column of projects to users and change. (2 marks)

(ii) Table 3 is an extract from a database. Use it to answer the questions that follow.

StudentID	CourseID	StudentName	Marks
100200	C236	Catherine	70
100201	C236	Agnes	80
100302	C242	Stephen	90
100322	C240	Alexis	80
100328	C240	John	86
100352	C240	Jemimah	79
100201	C241	Agnes	90

Table 3: Students

Write SQL statements to perform each of the following:

(I) display StudentID, StudentName for all students whose CourseID is C240; (2 marks)

(II) determine the total marks for the student Named Agnes and store the results in a field named TotalMarks; (2 marks)

(III) display the lowest mark scored for CourseID is C236. (2 marks)

(d) Describe each of the following types of *functional dependency:* (4 marks)

(i) fully functional;

(ii) transitive.

6. (a) Outline **two** concurrency controls applied in database management systems. (2 marks)

(b) State **two** differences between *object oriented* and *relational database* models. (4 marks)

(c) (i) Define the term *SQL injection* as used in databases. (2 marks)

(ii) Table 4 is an extract from a database. Use it to answer the questions that follow.

BookID	BookName	BookCategory	Status
B00501	Alice in wonderland	Fiction	IN
B04003	History of the world	General	IN
B04006	Our Country	General	OUT
B05002	A walk in the park	Fiction	OUT
B02001	School Rules	Reference	IN

Table 4: Book

Write an SQL statement that would perform each of the following:

    (I)   display all records from the table with records having status IN and arrange them based on the field name BookCategory in descending order;   (3 marks)

    (II)   remove all records with BookID labelled B02001 from the table;   (2 marks)

    (III)   display fields BookID, BookName for the books with BookID starting with *BO4* or BookCategory fiction.   (3 marks)

(d)   Explain **two** ways in which organisations can cope with challenges that arise from database emerging technologies.   (4 marks)

7.   (a)   Define each of the following terms as used in databases.   (4 marks)

    (i)   authorization;

    (ii)   authentication.

(b)   Explain **two** circumstances that would prompt an organisation to use a *special purpose* database.   (4 marks)

(c)   Distinguish between a *composite key* and a *compound key* as used in databases.   (4 marks)

(d)   Table 5 shows the structure of a table named Car. Use it to answer the questions that follow:

Field	Data Type
CarID	Integer
Model	VarChar(20)
YearofManufacture	Date
Status	Integer

Table 5: Car

Write an SQL statement that would perform each of the following:

    (i)   create the table Car with the relevant fields;   (3 marks)

    (ii)   make CarID the primary Key;   (2 marks)

    (iii)   add fields named *Make* and *Price* that store *30 characters* and *numbers* respectively.   (3 marks)

8.   (a)   Define the term *database security* as used in databases.   (2 marks)

(b)   Explain **two** ways in which the role of a database designer complements that of a database developer.   (4 marks)

(c)   Table 6 and 7 are extracts from a database. Use them to answer the questions that follow:

GradeID	GradeName
002	Tutor
003	Assistant Lecturer
004	Lecturer
005	Professor

Table 6: Grade

LecturerNo	LecturerName	GradeID	Salary	Age	YearEmployed
L345675	Eunice	003	30000	45	1982
L347890	Agnes	003	45000	60	1985
L345679	Alex	002	56000	55	1989
L456782	Ted	008	25000	22	1996
L789073	Felix	012	15000	35	1994
L897032	Gladys	015	50000		1998

Table 7: Lecturer

(i)   State an appropriate data type for the field named GradeName.   (1 mark)

(ii)   Write SQL statements to perform each of the following:

   (I)   display the LecturerNo, LecturerName and Salary of all the lecturers with GradeName "Assistant Lecturer".   (3 marks)

   (II)   display the LectureNo, GradeID and Salary for all Lecturers above age 50 and YearEmployed is between 1980 and 1992.   (3 marks)

   (III)   display all details of the lecturers whose age is not captured in the table Lecturer.   (3 marks)

(d)   Jane intends to commence the requirements gathering phase for the development of a database management system in her organisation. Outline **two** reasons why she should consider each of the following during the phase:

(i)   Reviewing of existing organisational documentation;   (2 marks)

(ii)   Understanding the current operating environment.   (2 marks)

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