

2920/206

**DATABASE MANAGEMENT SYSTEM**

July 2017

Time: 3 hours



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**

**DIPLOMA IN INFORMATION TECHNOLOGY**

**MODULE II**

**DATABASE MANAGEMENT SYSTEM**

**3 hours**

**INSTRUCTIONS TO CANDIDATES**

*You should have an answer booklet for this examination.*

*This paper consists of **EIGHT** questions.*

*Answer any **FIVE** 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.**

1. (a) Define each of the following terms as used in databases (4 marks)
- (i) Normalization;
  - (ii) Compound key.
- (b) Explain the term *database organization* as used in databases. (2 marks)
- (c) Distinguish between the role of a *database end user* and *database developer*. (4 marks)
- (d) (i) Table 1 is a structure of a table named *Department* in a database. Use it to answer the questions that follow.

| Field    | Description |
|----------|-------------|
| DeptNo   | Number(10)  |
| DName    | Varchar(20) |
| Location | Varchar(25) |

Table 1

Write an SQL statement to perform each of the following: (8 marks)

- (I) Rename the field named *DeptNo* to *departmentName*;
- (II) Remove the field named *Location*;
- (III) Add a field named *dateStarted* having date type;
- (IV) Remove the table.

(ii) Explain the data type *varchar* as used in the structure of the table (2 marks)

2. (a) Explain **two** reasons that may lead an organisation not to use a database management system. (4 marks)
- (b) Outline **two** roles of each of the following in a database management system environment: (4 marks)
- (i) Hardware;
  - (ii) Data.
- (c) Interpret the following SQL statement: (3 marks)
- ```
SELECT deptNo, count(*)
FROM Employees
group by deptNo;
```

- (d) Table 2 shows unnormalised table. State a step by step process of normalising to 3NF. (9 marks)

| Salesperson Number | SalesPerson Name | Customer Number | Customer Name | storeNumber | storeLocation | SaleAmount |
|--------------------|------------------|-----------------|---------------|-------------|---------------|------------|
| 2368               | Jane             | 0005            | Andrew        | 3           | Hailesalase   | 3000       |
|                    |                  |                 |               |             | Hailesalase   | 1500       |
|                    |                  |                 |               |             | Moi Avenue    | 3000       |
| 2456               | Ben              | 0009            | Steven        | 5           | Kijabe street | 4500       |
| 3456               | Gladys           | 0007            | Maggie        | 7           | Pangani       | 2500       |

Table2

3. (a) Outline **two** reasons for considering database security. (2 marks)
- (b) Explain **two** recovery techniques that can be used in case of a database failure. (4 marks)
- (c) Explain each of the following terms as used during the creation of tables in a database. (6 marks)
- (i) cascade;
  - (ii) restrict;
  - (iii) set null.
- (d) Study the following narrative and use it to answer the question that follows.

*A student must be enrolled on only one course and a course must have students enrolled on it. Each course is identified by a deptId, courseId and course name. Each course must have a number of modules and a module must be part of at least one course. A module is identified by moduleId, module name and must have a lecturer as a subject leader but a lecturer may not necessarily be a subject leader or may lead more than one module.*

Draw an entity relationship diagram showing cardinality and optionality. (8 marks)

4. (a) Distinguish between the *Grant* and *Revoke* commands as used in databases. (4 marks)
- (b) With the aid of a diagram, distinguish between the output FROM the *union* and the *intersection* operators. (6 marks)
- (c) Explain **two** characteristics of the *conceptual model* of a database design. (4 marks)

- (d) (i) Write the algebraic expressions equivalent to the following SQL statements: (3 marks)
- SELECT Distinct Gender, Salary  
FROM Employee;
- (ii) Write the SQL statement equivalent to the following algebraic expression. (3 marks)

$$\sigma_{assetcategory=furniture}(Asset)$$

5. (a) Define the term *data abstraction* as used in database management systems. (2 marks)
- (b) Explain **two** disadvantages of database approach. (4 marks)
- (c) With the aid of an example, describe **two** categories of SQL statements as used in databases. (5 marks)
- (d) Table 3 shows a table named *Employee* in a database used by employer to manage employees' salaries. Use it to answer the question that follows

| EmpNo.  | EmpName   | Salary | Grade |
|---------|-----------|--------|-------|
| E234567 | Catherine | 10000  | A     |
| E234568 | Agnes     | 15000  | A     |
| E234569 | Alex      | 25000  | D     |
| E234570 | Peter     | 25000  | D     |
| E234571 | Ted       | 30000  | C     |
| E234573 | Esther    | 75000  | A     |

Table 3

Write an SQL statement that would: (9 marks)

- (i) display the salary of all employees whose Grade value is D.
- (ii) change Alex's salary to 30000.
- (iii) display all employees with grade A and salaries with values between 10,000 and 15,000.
- (iv) display the minimum and maximum salary.
6. (a) Outline **three** types of *end users* in a database environment. (3 marks)
- (b) Differentiate between the *prime attribute* and a *non-prime attribute* as used in databases. (4 marks).
- (c) Describe **two** ways of classifying database management system. (4 marks)

- (d) Table 4 shows a database table named students. Use it to answer the questions that follow:

| SID | SNAME     | LNAME  | MARKS |
|-----|-----------|--------|-------|
| 001 | Jane      | Luke   | 50    |
| 002 | Agness    | James  | 70    |
| 003 | Josephine | Eliud  | 90    |
| 004 | Catherine | Joseph | 40    |
| 005 | Susan     | Clark  | 30    |

Table 4

Write a relational calculus statement that would:

- (i) display the records for the fields SID, SNAME and LNAME of all students. (3 marks)
- (ii) display the records in the field SNAME, LNAME and MARKS for all students with MARKS values more than 60. (3 marks)
- (iii) display the MARKS values for a student with SNAME is "Catherine" and LNAME "Joseph". (3 marks)
7. (a) Explain each of the following terms as used in databases. (4 marks)
- (i) Two- tier client server architecture;
- (ii) Candidate key.
- (b) Susan a database administrator is working on a table named *Employee* with the following attributes:
- Employee (EmployeeNumber, DepartmentNumber, hours, EmployeeNumber, DepartmentName, DepartmentLocation)*
- (i) State **three** functional dependencies that can be derived from the table. (3 marks)
- (ii) Outline **three** challenges she would encounter when working with data on the table. (3 marks)
- (c) Explain **two** reasons that may lead to the migration from the file based to a database centred approach. (4 marks)
- (d) With the aid of a diagram outline the stages of the database design cycle. (6 marks)
8. (a) Explain **two** circumstances under which an organization would implement a centralized database system. (4 marks)
- (b) With the aid of a diagram, outline **two** paradigms the early models of databases were based on. (4 marks)

- (c) Distinguish between the entity relationship diagrams in figure 1 and in figure 2. (4 marks)

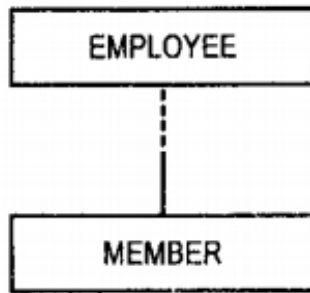


Figure 1

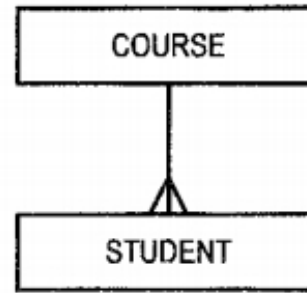


Figure 2

- (d) Write SQL statements that would perform each of the following operations on the table named *Department*: (8 marks)
- Make the field *Dnumber*, a primary key;
  - Make the field *Dname* *VARCHAR(50)* not to accept a null value;
  - Make the field named *Dnumber* to hold values greater than 10

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