

Name: _____ Index No: _____

2920/206
DATABASE MANAGEMENT SYSTEMS
November 2012
Time: 3 hours

Signature: _____

Date: 9/2/13



27 FEB 2013

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

3 hours

INSTRUCTIONS TO CANDIDATES

Write your *name* and *index* number in the spaces provided above.
Sign and write the date of examination in the spaces provided above.
Answer any **FIVE** of the following **EIGHT** questions in the space provided.
All questions carry equal marks.

For Examiner's Use Only

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Total Marks |
|----------|---|---|---|---|---|---|---|---|-------------|
| Marks | | | | | | | | | |

27 FEB 2013

This paper consists of 15 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) (i) Explain each of the following transaction properties as used in database management systems:

I. isolation; (1 mark)

II. durability. (1 mark)

(ii) Describe **two** problems that could arise due to interference between concurrent transactions. (4marks)

(b) Describe **three** integrity constraints that could be applied on a database management system during its design stage. (6 marks)

(c) The following are outputs from algebraic operations involving tables in a database management system.

- (i) A table consisting of all rows appearing in both relations.
- (ii) A table consisting of all possible rows appearing in the first and not in the second relations.
- (iii) A table consisting of all rows appearing in either or both relations.
- (iv) A table consisting of all rows from a specified relation that satisfy a specific condition.

Identify the algebraic operation in each case.

(4 marks)

- (d) Table 1 shows details of Bidii Self Help group members. Use it to answer the questions that follow.

| MemberID | LastName | FirstName | Address | Town |
|----------|----------|-----------|-----------|----------|
| B001 | Amani | John | 10-990099 | Mombasa |
| B002 | Umoja | Peter | 23-770077 | Kakamega |
| B003 | Baraka | Mary | 20-330033 | Nairobi |

Table 1

Given that the relation is named Member, write an SQL statement that could be used to display:

- (i) *MemberID* and *FirstName* for all members whose town is Kakamega. (2 marks)

- (ii) Member's details sorted in descending alphabetic order using the Town field. (2 marks)

2. (a) (i) Outline the function of each of the following SQL commands:

- I. `initcap;` (1 mark)

- II. `sysdate;` (1 mark)

- III. `distinct.` (1 mark)

- (ii) The statement *substring(firstname, n, m)* is an SQL function with three arguments. Outline the use of each argument. (3 marks)

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

- (i) prototyping; (2 marks)

- (ii) testing; (2 marks)

- (iii) maintenance. (2 marks)

- (c) Table 2 shows Safari Company trainees' details. Use it to answer the question that follows.

| Trainee_ID | Trainee_Surname | Course_Code | Course_Name | Tutor_FName | Tutor_Office |
|------------|-----------------|-------------|---------------------------|-------------|--------------|
| T101 | Brian | ACC 1 | Principles of Accounting | Peter | ADM1 |
| T102 | William | MKT 1 | Introduction to Marketing | Cecil | ADM3 |
| | | MKT 2 | International Marketing | Mary | ADM2 |
| T103 | Sospeter | MKT 1 | Introduction to Marketing | Cecil | ADM3 |

Table 2

- (c) Jane is a newly recruited database administrator. Explain **three** roles that she would be expected to perform in her day to day work. (6 marks)

- (d) (i) Using a diagram represent the Cartesian product of the attributes M and N given that $M=(a, b)$ and $N=(1,2)$. (2 marks)

- (ii) Table 3 shows an extract of patient details in a certain dispensary. Use it to answer the questions that follow.

| PatNumber | PatName | AppointmentDate |
|-----------|---------|-----------------|
| P453 | Abraham | 16-11-2012 |
| P467 | Joel | 17-11-2012 |
| P472 | Ann | 16-11-2012 |

Table 3

Given that the relation is named Patient, write a relational algebraic expression for each of the following statement:

- I. display all patients' number and name; (2 marks)

II. display all patients' details whose appointment date is 17-11-2012; (2 marks)

III. display the patient name and appointment date for a patient whose number is P472. (2 marks)

4. (a) Explain each of the following database system objects:

(i) Form; (2 marks)

(ii) Report. (2 marks)

(b) Outline **four** functions of *database views* in database systems. (4 marks)

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- (c) A certain company intends to automate its records. It hired an ICT consultant to assist in the design and development of a database system. Explain **three** factors that the consultant would consider while designing the system.

(6 marks)

- (d) A certain organization has information stored in its database. Describe **three** computer based security control features that the organization could put in place to enhance the security of the information.

(6 marks)

5. (a) ABC Company Ltd uses file based systems in its operations. Explain **two** challenges the company could be facing.

(4 marks)

- (b) Differentiate between *logical* and *physical* phases as used in database design life cycle. (4 marks)

- (c) Table 4 shows details of rental houses in a certain town. Use it to answer the questions that follow.

| HouseNo | Type | Estate | Rent_Per_Month(KSH) |
|---------|--------------|----------|---------------------|
| H16 | One Bed room | Kahama | 9000 |
| H17 | One Bed room | Barabara | 8500 |
| H18 | Two Bed room | street | 15000 |
| H19 | Two Bed room | Barabara | 13500 |
| H20 | One Bed room | Street | 1400 |
| H21 | Bed sitter | Kahama | 9000 |

Table 4

- (i) A new tenant is required to pay the monthly rent, a deposit equivalent to one month's rent and water deposit of Ksh 3000. Write an SQL statement that would display the HouseNo and the amount to be paid by the new tenant as initial rent. Use House as the table name. (2 marks)

- (ii) Write an SQL statement that would display details of one bed-roomed house whose rent per month is Ksh 9000. (2 marks)

- (iii) If the rent per month for all houses is increased by 10%, write an SQL statement that could be used to display HouseNo, the original rent as old rent and the adjusted rent as new rent. (2 marks)

- (d) John, a database designer wishes to collect information about his organization. Describe **three** information gathering methods that he could use. (6 marks)

6. (a) ABC Company Ltd has implemented its database management system using a client server architecture.

- (i) Outline **four** functions of each of the following components of this architecture.

- I. client (2 marks)

- II. server (2 marks)

- (ii) Explain **two** benefits that the company is likely to accrue from this move. (2 marks)

- (b) Table 5 shows details of employees in a certain company. Use it to answer the questions that follow.

| EmployeeID | First_Name | Surname | Branch_NO | Branch_Name | Basic_Salary |
|------------|------------|---------|-----------|-------------|--------------|
| 50043 | John | Bahari | 01 | Central | 40000 |
| 50123 | Ruth | Ziwani | 02 | Eastern | 35000 |
| 50145 | Peter | Mwanzo | 02 | Eastern | 38000 |
| 50167 | Ali | Mwisho | 01 | Central | 42000 |
| 50185 | Ruth | Bakari | 01 | Central | 48000 |

Table 5

Write an SQL statement that could be used to:

- (i) Change the name Ziwani to Zawadi. (2 marks)

- (ii) Display the BranchName and the number of employees in each branch. (2 marks)

- (iii) Remove the details of Ruth Bakari from the database. (2 marks)

- (c) Describe **two** relational calculus quantifiers used in databases. (4 marks)

- (d) With the aid of an example in each case, differentiate between *unary* and *binary* operations as used in relational algebra. (4 marks)

7. (a) Explain **two** roles of a physical database designer. (4 marks)

- (b) Explain each of the following terms as used in database management systems.

- (i) Data mining; (2 marks)

- (ii) Data warehousing. (2 marks)

- (c) (i) Table 6 and 7, which are named student and subject respectively contain students' details. Use them to answer the questions that follow.

| RegNo | Fname | Address | Town | PhoneNo |
|--------|---------|---------|---------|-------------|
| CIT001 | Janet | 122 | Mombasa | 079 999 888 |
| DIT002 | Timothy | 322 | Nairobi | 079 888 999 |
| DCS003 | Emmily | 444 | Nairobi | 079 666 777 |

Table 6: Student

| Course Code | CourseName | EntryGrade(KCSE) | RegNo |
|-------------|-----------------------------|------------------|--------|
| CIT | Certificate in IT | D+ | CIT001 |
| DIT | Diploma in IT | C (Plain) | DIT002 |
| DCS | Diploma in Computer Studies | C- | DCS003 |

Table 7: Subject

- I. Write an SQL statement that could be used to display the following fields; Fname, RegNo, PhoneNo and the CourseName for all the students. (2 marks)

- II. Write an SQL statement that could be used to display all details of students from the Students table whose Fname do not start with T. (2 marks)

- (ii) Explain the meaning of the word *subquery* as used in SQL. (2 marks)

- (d) Table 8 shows the design of a table named Employee. Use it to answer the questions that follow.

| FIELD NAME | PROPERTIES | | | | Length |
|-------------|------------|-----|-----|----------|--------|
| | Data type | PK | FK | Not Null | |
| Employee_ID | Number | Yes | | Yes | |
| Last Name | VarChar | | | Yes | 20 |
| First Name | VarChar | | | Yes | 20 |
| Dept ID | Number | | Yes | Yes | |

Table 8: Employee

- (i) Write an SQL statement that could be used to create the Employee table. (4 marks)

- (ii) A student typed the following SQL statement:

```
Insert into Employees
Values(Em001, Joan, Mwanzo, Administration,2011);
```

- Identify **four** errors in the statement. (2 marks)

8. (a) With the aid of an example in each case, explain the function of each of the following database operators.

(i) AND; (2 marks)

(ii) OR. (2 marks)

(b) Explain **three** challenges of a distributed database systems. (6 marks)

(c) Differentiate between *shared* and *exclusive* locks as used in database concurrency controls. (4 marks)
