# KIBABII UNIVERSITY

## UNIVERSITY EXAMINATIONS
## 2021/2022 ACADEMIC YEAR

## END OF SEMESTER EXAMINATIONS
## YEAR THREE SEMESTER ONE

## FOR THE DEGREE IN
## (COMPUTER SCIENCE)

**COURSE CODE : CSC 316**

**COURSE TITLE : DATABASE SYSTEMS**

**DATE: 17/05/2022** **TIME: 09.00 A.M – 11.00 A.M.**

**INSTRUCTIONS TO CANDIDATES**

ANSWER **QUESTIONS ONE AND ANY OTHER TWO.**

## QUESTION ONE (COMPULSORY) [30 MARKS]

a) Briefly explain any FIVE common database mistakes that are made during the database design process. [5 Marks]

b) With the aid of an example, distinguish between integrity and domain constraints as used in databases [4 marks]

Table 1 shows information from a *bookDetails* relation in a relational database. Use it to answer the questions that follow.

Table 1

| **Book_id** | **BookTitle** | **BookAuthor** |
|---|---|---|
| B2233 | Introduction to Databases | Thomas |
| B2234 | Developing Database Systems | Connely |
| B2235 | Database Administration | Charles |

c) Write a Structured Query Language that would:

i) Display the authors of books from the *booksDetails* relation whose Book_Id is greater than or equal to B2235. [2 Marks]

ii) Add a new record: *B2236, Database Applications, Peter* into the relation [2 Marks]

iii) Remove the Book titled *'Introduction to Databases'* from the relation [2 Marks]

iv) Sort the table by Book_Id in descending order [2 Marks]

v) Display the total number of books authored by '*Thomas*' in the relation [2 Marks]

d) In a University, a student is identified by admission number, names which consist of the first and the second name, date of birth, their phone numbers which includes that of the guardian. Each Student belongs to a class which is identified by a class name. Students are free to register in one or more clubs. Each club is identified by a club name and club identification code.

Represent the information using an entity relationship diagram [7 Marks]

e) Explain Four advantages of using views in a database [4 Marks]

## QUESTION TWO [20 MARKS]

a) Define the term weak entity as used in databases [2 Marks]

Table 2 shows details of a student table. Use it to answer the questions that follow:

**Table 2:** Student details

| Student No. | Student Name | DoB | Gender | CourseID | Marks |
|---|---|---|---|---|---|
| N001 | Jane | 23.06.98 | Female | C004 | 70 |
| N002 | Andrew | 22.05.96 | Male | C003 | 75 |
| N003 | Catherine | 18.09.98 | Female | C004 | 90 |
| N004 | Agnes | 16.06.99 | Female | C002 | 92 |
| N005 | Noel | 26.04.98 | Male | C004 | 65 |
| N006 | Martin | 14.07.98 | Male | C001 | 63 |

b) Write an SQL expression that would

i) Display all records of female students who attained more than 70 Marks **[2 Marks]**

ii) Display all the course ID of the students **[2 Marks]**

iii)Rename the relation students to 'Student Marks' and the attribute student_Id to S_Id **[3 Marks]**

c) Describe each of the following phases in the database life cycle: **[6 Marks]**

i) Requirement phase

ii) Conceptual phase

iii)Physical design phase

d) Describe the term repeating group as used in normalization **[2 Marks]**

e) Using the following tables, differentiate between the output generated from the operation A U B and A n B operation **[3 Marks]**

Table A

| **Personal No** |
|---|
| K133 |
| K137 |
| K143 |
| K145 |
| K146 |

Table B

| **Personal No** |
|---|
| K135 |
| K137 |
| K145 |
| K143 |
| K147 |

## QUESTION THREE [20 MARKS]

The following statement has errors

**SELECT Name, Location FROM Employee, where location = Nairobi;**

a) Identify the errors and correct the statement **[2 Marks]**

b) Differentiate between fully functional and transitive dependency as used in databases

**[4 Marks]**

c) Explain the role of the following in a database management system: **[4 Marks]**

a) Data definition language

b) Data manipulation language

**Table 3**: Employee data

| Emp No | Emp Name | Department No | Dept Name | Department Manager |
|---|---|---|---|---|
| K987 | Jane Abraham | 101 | Marketing | Alex Stephen |
| K876 | Stephy Jacobs | 102 | Production | Grace Johns |
| K234 | Frank Edward | 103 | Accounts | Evans |
| K235 | Josephine Ted | 106 | Marketing | Alex stephen |
| K256 | Stephen More | 109 | Accounts | Evans |

Explain a scenario in Table 3 that may lead to occurrence of each of the following anomalies

**[6 Marks]**

i. Update anomaly

ii. Insertion anomaly

iii. Deletion anomaly

d) Explain two criteria that may be used to choose physical design in database **[4 Marks]**

## QUESTION FOUR [20 MARKS]

Table 4 shows a Students result slip. Use it to answer the questions that follow.

**Table 4:** Student result slip

| Student No: 1022567<br>Student Name: Alex James<br>Course Title: ICT<br>Code: F105 | | | | Course | |
|---|---|---|---|---|---|
| Subject Code | Subject Title | Number of HRS | Grade | Result Code | Remarks |
| BUS 119 | Business operations | 20 | 10 | PA01 | PASS |
| COM 110 | Introduction to Computers | 21 | 8 | PA02 | PASS |
| COM 112 | Application development | 20 | 2 | RE01 | Refer Exam |
| COM 114 | Human Computer Interaction | 10 | 7 | RE00 | Refer Exam |

a) Normalize the table to the 3NF **[10 Marks]**

b) Explain Six advantages of a distributed database system **[6 Marks]**

c) A database administrator wants to apply the union, intersection and difference operation to a relation. Explain two conditions she must check that the relations fulfil before applying the operations **[4 Marks]**

## QUESTION FIVE [20 MARKS]

a) Explain two benefits of normalization in databases **[4 Marks]**

b) Distinguish between the output of the SQL statement A and B **[2 Marks]**

| A. | B. |
|---|---|
| i) SELECT DISTINCT (Grade) from Employee | ii) SELECT DISTINCT (Grade) from Employee |

Table 5 is a table named Results in a database. Use it to answer the questions that follow:

**Table 5:** Results

| FirstName | Surname | Idno | DoB | Marks |
|---|---|---|---|---|
| Alice | Smith | 35689021 | 23.06.2000 | 95 |
| Alex | Maps | 36879060 | 22.05.2001 | 60 |
| Banice | Young | 35879067 | 18.09.2000 | 75 |
| John | Wallace | 3111729 | 16.06.1999 | 55 |

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

i. Display all records from the fields FirstName, Surname and IDNO [2 Marks]

ii. Display the age for John Wallace [2 Marks]

iii. Display all the records whose marks range from 50 to 90 [3 Marks]

iv. Sort all the records from highest to lowest based on Marks [2 Marks]

v. Display all records whose first name starts with letter 'A' [2 Marks]

d) Outline two differences between homogenous and heterogeneous distributed database system [3 Marks]