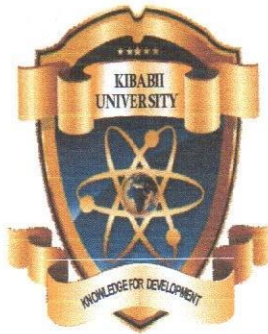*(Knowledge for development)*

KIBABII UNIVERSITY
(KIBU)

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR TWO SEMESTER TWO EXAMINATIONS

FOR THE DEGREE IN
(INFORMATION TECHNOLOGY)

COURSE CODE   :   BIT 227
COURSE TITLE   :   DATABASE SYSTEM DESIGN AND DEVELOPMENT

DATE: 06/10/2021   TIME: 9.00 A.M-11.00 A.M

INSTRUCTIONS TO CANDIDATES
ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

a) Using explain the following database integrities   [6 Marks]

   i. Entity

   ii. Validity

   iii. Referential

b) Use the table to answer the following:

STAFF NO	FIRST NAME	LAST NAME	POSITION	GENDER	DOB
S101	ANN	MAKORI	MANAGER	F	10/10/1981
S102	RODNEY	HENRY	SUPERVISOR	M	1/3/1972
S103	JANE	JOHNSON	DRIVER	F	11/12/1999
S104	QUINCE	MATHEWS	MANAGER	M	24/09/1987
S105	DON	HILL	MANAGER	M	13/10/1976

i. Which of the fields in the table is most likely to be primary key and why?   [2 Marks]

ii. Write an SQL statement that will produce a list of all staff showing the staff no, last names, and first names only.   [3 Marks]

iii. Write an SQL statement that will generate the same list as (ii) above but with the last name and first name combined as staff names.   [2 Marks]

iv. Write an SQL statement to display details of all staff whose position is Driver.   [2 Marks]

v. Write an SQL statement to display details of all staff whose position born before 1980. [2 marks]

vi. Write an SQL statement that would count the different types of positions for the employees.

                 [3 Marks]

c) Using sketches in each case, explain the following map operations on the database: [6 Marks]

   i. Equijoin

   ii. Product

   iii. Intersection

d) What is a system catalog? Outline the information stored in the system catalog.   [4 Marks]

QUESTION TWO [20 MARKS]

a) Explain the importance of normalization   [2 Marks]

A car company dealing with importation of cars on behalf of clients is based in Mombasa. Shipped vehicles are characterized by unique car identification number, car weight, car type, and destination and

delivery date. Shipped vehicles are received at the company godowns. Each go down is characterized by a unique go-downId, location and telephone number; shipped vehicles make their way to their clients via standard gauge railways or by road. Each client name, address and the types of transport used to deliver the cargo.

    i. Draw an entity relationship diagram for the above information   **[8 Marks]**

    ii. With the aid of an example distinguish between a composite attribute and a derived attribute as used in ER diagrams   **[4 Marks]**

b) Differentiate between the following concepts: **[6 Marks]**

    i. Database and data warehouse

    ii. Data security and data integrity

QUESTION THREE [20 MARKS]

a) Explain what is meant by a functional dependency in a relation. Give an example   **[2 marks]**

b) Study the following table and answer the questions that follow:

ID	Name	Hostel	Age	Salary
500	Patrick	Red	44	22000
510	Dolly	Blue	30	45000
520	Sindy	Orange	35	26000
530	Lucy	Red	20	44000

Write an SQL statement that would:

i) Sort the hostel workers table by the name and salary in descending order   **[2 Marks]**

ii) Find the average salary for all employees   **[2 Marks]**

iii) Find salary more than twenty one thousand and less than thirty thousand and in red hostel

                                              [3 Marks]

iv) Display all the records having names that end with letters "y"   **[2 Marks]**

v) Increase salary for all employees by 5%   **[3 Marks]**

c) For each of the following two relational concepts explain the key ideas behind them and using a sample relation of your own choosing provide suitable examples   **[6 Marks]**

    i) Entity integrity

    ii) Referential integrity

QUESTION FOUR [20 MARKS]

a) How would you describe a condition in which one attribute is dependent on another attribute and neither attribute is part of the primary key? Reduction to which normal form is designed to eliminate such dependencies **[2 Marks]**

b) A company places order for items. Each order is placed on a given date and may include a variety of items in different quantities. The following table shows a sample of orders. The primary Key is (OrderNo, ItemNo)

Order No	Item No	Item Description	Date	Quantity
1	1	Screw	6-June-2017	100
1	2	Bolt	6-Jan-2017	50
2	3	Flange	2-Feb-2017	10
2	2	Bolt	2-Feb-2017	40
2	1	Screw	2-Feb 2017	80

i) Explain why this table is not in 2nd normal form **[2 marks]**

ii) Describe **Two** types of anomaly that could be caused by update, insert or delete operations giving an example of each, with reference to the above table **[4 Marks]**

iii) Transform the table into 2nd normal form. Show the structures of the resultant table **[4 Marks]**

c) Explain briefly what is meant by a weak entity type. Provide an example of a Weak Entity Type using an example of your choice **[2 Marks]**

d) Explain the **SIX** phases carried out during the development of a database system. **[6 Marks]**

QUESTION FIVE [20 MARKS]

a) Below is information provided by a college registrar to aid in developing their database, use it to answer the questions below: -

> *A university registrar's office maintains data about the following entities:*
>
> *Courses, including number, title, credits, syllabus, and prerequisites;*
>
> *Course offerings, including course number, year, semester,, instructor(s), timings, and classroom;*
>
> *Students, including student-id, name, and program;*
>
> *Instructors, including identification number, name, department, and title.*

Further, the enrolment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modelled.

i) Draw an ER diagram of the above information [9 Marks]

ii) Add cardinality of the relationships to the ER diagram above [3 Marks]

b) In the context of the relational database design:

i. Define normalization [2 Marks]

ii. Describe the steps in normalization up to and including third normal form. [6 Marks]