(Knowledge for Development)

KIBABII UNIVERSITY
(KIBU)

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR ONE SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF MASTERS OF SCIENCE

(INFORMATION TECHNOLOGY & MBA WITH IT)

COURSE CODE: MIT 810/MIB 812
COURSE TITLE: DATABASE SYSTEMS AND INFORMATION MODELLING

DATE: 18/06 /2022   TIME: 9.00 AM - 12.00 NOON

INSTRUCTIONS TO CANDIDATES
ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS) [COMPULSORY]

a. Compare and contrast file management systems and database management systems. [4 Marks]

b. Explain DBMS data abstraction. [2 Marks]

c. Describe the levels of data abstraction in DBMS. [6 Marks]

d. Discuss the benefits of query optimization. [4 Marks]

e. Hakuna Matata enterprises prides itself on having up-to-date information on the processing and current location of each shipped item. To do this, Hakuna Matata enterprises relies on a company-wide information system. Shipped items are the heart of the Hakuna Matata enterprises product tracking information system. Shipped items can be characterized by item number (unique), weight, dimensions, insurance amount, destination, and final delivery date. Shipped items are received into the Hakuna Matata enterprises system at a single retail center. Retail centers are characterized by their type, uniqueID, and address. Shipped items make their way to their destination via one or more standard Hakuna Matata enterprises transportation events (i.e., flights, truck deliveries).

These transportation events are characterized by a unique scheduleNumber, a type (e.g, flight, truck), and a deliveryRoute.

   i. Create an Entity Relationship diagram that captures this information about Hakuna Matata enterprises system. Be certain to indicate identifiers and cardinality constraints. [10 Marks]

   ii. Convert the Entity Relationship diagram created in (i) above into a relational model. [4 Marks]

QUESTION TWO (15 MARKS)

a. Discuss the pros and cons of Heap File Organization. [4 Marks]

b. Describe the two major integrity rules that exist in the DBMS. [4 Marks]

c. Discuss the conditions that must met for an attribute to be defined as a primary key. [3 Marks]

d. Given the dependency diagram shown in the Figure below, identify and discuss each of the indicated dependencies. [4 Marks]
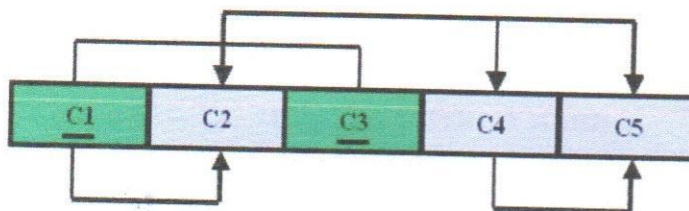
QUESTION THREE (15 MARKS)

a. With the help of valid examples, discuss the types of data anomaly in databases. [6 Marks]

b. Study the table shown below and answer the questions that follow

StaffNo	Branchno	BranchAddress	Name	Position	HoursPerWeek
S4555	B002	City Center Plaza, Nairobi, 98122	John Owuor	Assistant	16
S4555	B004	Kenyatta Avenue, Nakuru, 98128	John Owuor	Assistant	9
S4612	B002	City Center Plaza, Nairobi, 98122	Dave Okiring	Assistant	14
S4612	B004	Kenyatta Avenue, Nakuru, 98128	Dave Okiring	Assistant	10

i. Explain why this table not in 2NF. **[2 Marks]**

ii. Describe and illustrate the process of normalizing the data shown in this table to third normal form (3NF). **[6 Marks]**

iii. Identify the primary and foreign keys in the 3NF relations. **[1 Mark]**

QUESTION FOUR (15 MARKS)

a. Explain the concept of ACID properties in DBMS. **[4 Marks]**

b. Two transactions have their operations interleaved as shown in the table below. Study the table and answer the questions that follow.

T1	T2
read-item(X);	
X:=X-N;	
	read-item(X);
	X:=X+M;
write-item(X);	
read-item(Y);	
	write-item(X);
Y:=Y+N;	
write-item(Y);	

Is there any concurrency problem? If so, explain the problem. **[3 Marks]**

c. Using a well labelled diagram, describe the states of a transaction in database systems. **[8 Marks]**

QUESTION FIVE (15 MARKS)

a. Using valid examples, show how appropriate relational algebra operations would be used to extract. **[4 Marks]**

   i. specific tuples.

   ii. specific attributes

b. Explain why we use constraints in databases. **[2 Marks]**

c. Describe any two constraints used while creating databases in SQL. **[4 Marks]**

d. Consider the following schema

STUDENTS(studentRegNo, first_name, last_name, email, phone_no, date_of_birth, honours_subject, percentage_of_marks);

Write SQL query that would display names of all students in descending order of percentage of marks. **[2 Marks]**

e. Describe the purpose of an index in a database. In what situation would you not use an index. **[3 Marks]**