



*(Knowledge for Development)*

**KIBABII UNIVERSITY**

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**UNIVERSITY EXAMINATIONS**

**2018/2019 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS**

**YEAR TWO SEMESTER ONE EXAMINATIONS**

**FOR THE DEGREE OF**

**BACHELORS OF SCIENCE**

**(INFORMATION TECHNOLOGY)**

**COURSE CODE: BIT 212**

**COURSE TITLE: INTRODUCTION TO DATABASE  
SYSTEMS**

**DATE: 28/01/2019**

**TIME: 9.00A.M. – 11.00A.M.**

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**INSTRUCTIONS TO CANDIDATES**

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

**QUESTION ONE [COMPULSORY] [30 MARKS]**

1. A relational database consists of a collection of \_\_\_\_\_ [1 Mark]  
a) Tables  
b) Fields  
c) Records  
d) Keys
2. Database \_\_\_\_\_ is the logical design of the database, and the database \_\_\_\_\_ is a snapshot of the data in the database at a given instant in time. [2 Marks]  
a) Instance, Schema  
b) Relation, Schema  
c) Relation, Domain  
d) Schema, Instance
3. Which one of the following is a set of one or more attributes taken collectively to uniquely identify a record? [1 Mark]  
a) Candidate key  
b) Sub key  
c) Super key  
d) Foreign key
4. The \_\_\_\_\_ operation allows the combining of two relations by merging pairs of tuples, one from each relation, into a single tuple. [2 Marks]  
a) Select  
b) Join  
c) Union  
d) Intersection
5. \_\_\_\_\_ is used to define the structure of the relation, deleting relations and relating schemas. [1 Mark] a)  
DML(Data Manipulation Language)  
b) DDL(Data Definition Language)  
c) Query  
d) Relational Schema
6. The \_\_\_\_\_ clause allows us to select only those rows in the result relation of the \_\_\_\_\_ clause that satisfy a specified predicate. [2 Marks]  
a) Where, from  
b) From, select  
c) Select, from  
d) From, where
7. `SELECT emp_name  
FROM department  
WHERE dept_name LIKE ' _____ Information Technology';`
- \_\_\_\_\_ has to be added into the blank to select the dept\_name which has Information Technology as its ending string. [1 Mark]  
a) %  
b) \_

- c) ||  
d) \$
8. A \_\_\_\_\_ indicates an absent value that may exist but be unknown or that may not exist at all. **[1 Mark]**  
 a) Empty tuple  
 b) New value  
 c) Null value  
 d) Old value
9. \_\_\_\_\_ includes records from the right table that have no matching key in the left table in the result set **[1 Mark]**  
 a) Left outer join  
 b) Right outer join  
 c) Full outer join  
 d) Half outer join
10. SQL view is said to be updatable (that is, inserts, updates or deletes can be applied on the view) if certain conditions are satisfied. Select the condition(s) that should be satisfied by the query defining the view. **[2 Marks]**  
 a) The from clause has only one database relation  
 b) The query does not have a group by or having clause  
 c) The select clause contains only attribute names of the relation and does not have any expressions, aggregates, or distinct specification  
 d) All of the mentioned
11. \_\_\_\_\_ makes the transaction permanent in the database **[1 Mark]**  
 a) View  
 b) Commit  
 c) Rollback  
 d) Flashback
12. Study the following SQL statements and answer the question that follow: **[2 Marks]**

```
CREATE TABLE Employee(Emp_id NUMERIC NOT NULL, Name VARCHAR(20) ,
dept_name VARCHAR(20), Salary NUMERIC UNIQUE(Emp_id,Name));
```

```
INSERT INTO Employee VALUES(1002, Wanyonyi, CSC, 10000;
INSERT INTO Employee VALUES(1006, Onyango, Finance, );
INSERT INTO Employee VALUES(1002, Mwangi, Sales, 20000);
```

What will be the result if the statements are executed.

- a) All statements executed  
 b) Error in create statement  
 c) Error in insert into Employee values(1006, Onyango, Finance, );  
 d) Error in insert into Employee values(1002, Mwangi, Sales, 20000);
13. \_\_\_\_\_ statement will find the ID, name, dept name, salary for lecturers whose salary is greater than 80,000. **[2 Marks]**  
 a)  $\{t \mid t \in \text{lecturer} \wedge t[\text{salary}] > 80000\}$   
 b)  $\exists t \in r(Q(t))$   
 c)  $\{t \mid \exists s \in \text{lecturer} (t[\text{ID}] = s[\text{ID}] \wedge s[\text{salary}] > 80000)\}$   
 d) None of the mentioned

14. \_\_\_\_\_ express the number of entities to which another entity can be associated via a relationship set. [1 Mark]
- Mapping Cardinality
  - Relational Cardinality
  - Participation Constraints
  - None of the mentioned
15. If every non-key attribute is functionally dependent primary key, then the relation will be in \_\_\_\_\_. [2 Marks]
- First normal form
  - Second normal form
  - Third form
  - Fourth normal form
16. \_\_\_\_\_ is a state where the database no longer reflects a real state of the world that it is supposed to capture. [2 Marks]
- Consistent state
  - Parallel state
  - Durable state
  - Inconsistent state
17. In Kibabii University a lecturer must have a firstdegree and at least a *postgraduatedegree* which can take single or several values. Treating *postgraduatedegree* as \_\_\_\_\_ permits lecturers to have several post graduate degrees associated with them. [2 Marks]
- an entity
  - an attribute
  - a relation
  - a value
18. A process where the entity set *person* is classified as student and employee is called \_\_\_\_\_. [1 Mark]
- Generalization
  - Specialization
  - Inheritance
  - Constraint generalization
19. \_\_\_\_\_ expression when executed will find all students who have taken all courses offered in the Information technology department. [2 Marks]
- $\exists t \in r(Q(t))$
  - $\forall t \in r(Q(t))$
  - $\neg t \in r(Q(t))$
  - $\sim t \in r(Q(t))$
20. An expression in the domain relational calculus is of the form: [1 Mark]
- $\{P(x_1, x_2, \dots, x_n) \mid \langle x_1, x_2, \dots, x_n \rangle\}$
  - $\{x_1, x_2, \dots, x_n \mid \langle x_1, x_2, \dots, x_n \rangle\}$
  - $\{x_1, x_2, \dots, x_n \mid x_1, x_2, \dots, x_n\}$
  - $\{\langle x_1, x_2, \dots, x_n \rangle \mid P(x_1, x_2, \dots, x_n)\}$

### QUESTION TWO (20 MARKS)

As a **database designer** you have been invited for an interview by the Bungoma County government. Part of the selection process is a technical interview. Answer the following questions from the interview panel.

- a. Explain, with examples, how a database table may be logically connected to another table, including the associated rules demanded by *referential integrity* to support such connectivity and any subsequent changes in either table. [7 Marks]
- b. Explain, with examples, how the rows in a given database table may be uniquely identified, including the associated rules demanded by *entity integrity* and what guidelines exist for the selection of such a row-identification mechanism. [7 Marks]
- c. Show how appropriate relational algebra operations would be used to extract. [6 Marks]
  - i. specific tuples.
  - ii. specific attributes
  - iii. specific attributes of specific tuples from a populated database table.

### QUESTION THREE (20 MARKS)

A **SQL developer** is bidding for a new contract with Safaricom Kenya. Part of the selection process is a technical interview. Answer the following questions from the interview panel:

- a. For each of the following terms, explain what the term stands for, the essence of the functions it provides and a set of example SQL statements (at least TWO for each) that implement these functions: [12 Marks]
  - i. DDL.
  - ii. DML.
  - iii. DCL.
- b. The following table gives information about staff in Techno Brain Company

<u>StaffID</u>	<u>FirstName</u>	<u>LastName</u>	<u>ProjectNo</u>	<u>PhoneNo</u>	<u>Salary</u>
0309	John	Wafula	P03	0721456789	50000
0312	Mary	Siambe	P03	0734889098	60000
0314	George	Owade	P05	0722456789	45000
0315	Jim	Ogungo	P05	0724789087	40000

- c. It has been decided to develop a number of views based on this table for the convenience of the users. Suggest an example of a horizontal view of this table, and an example of a vertical view, and explain why each might be useful. (In each case write SQL for the view and list the contents of the view. [8 Marks]

### QUESTION FOUR (20 MARKS)

- a. Relational databases are very effective in situations for which they are appropriate. In other situations, simpler file-based solutions may be sufficient. Suppose you are required to implement a system for storing information about a library's books, borrowers, and loans.

Discuss FOUR reasons why a database system is superior to a file-based system for this task. Illustrate the answer with suitable examples. [10 Marks]

b. JERO agencies keeps invoices in the format shown below:

<b>customerID: C12    custName: Rose Akinyi    custAddress: 1699-50200 Bungoma</b>			
<b>productCode</b>	<b>prodName</b>	<b>Price</b>	<b>Quantity</b>
P1	Laptop	40000	2
P2	iPad	25000	3
P3	HP LaserJet printer	14000	1

- i. Identify the repeating group of attributes and transform the above format into tables that are in 1st Normal Form. [4 Marks]
- ii. Identify any partial dependencies and transform into tables that are in 2<sup>nd</sup> Normal Form. [4 Marks]
- iii. Identify any transitive dependencies and transform into tables that are in 3<sup>rd</sup> Normal Form. [2 Marks]

#### QUESTION FIVE (20 MARKS)

**Study the following scenario and answer the questions that follow**

Flight Safaris; a travel company provides a selection of **Hotels** that prospective customers can reserve prior to booking a room. A customer can select from a range of **Accommodation Types** that each hotel offers to suit their requirements. Details of the accommodation type include the catering facilities either Self Catering (SC); Half Board (HB); Full Board (FB). The bed type either Twin bed (T); Double bed (D); Suite (S). The price of the hotel is determined by the hotel and the type of accommodation offered.

Assume that:

- Each **hotel** is identified by a hotel code.
- The **accommodation type** is identified by a unique accommodation type code.
- Accommodation is only available during the month of January in 2019.

The Figure below is a representative sample of data about hotels and the accommodation types offered by each hotel.

## Hotel Accommodation

RESORT	HOTEL CODE	HOTEL NAME	CATERING	BED TYPE	ROOM PRICE	ACCTYE CODE	MONTH
Masai Mara	FMG	Flamingo	SC	T	1500	12	January
Sarova 5 Star	MBH	Mombasa	SC	T	1900	12	January
Masai Mara	KIF	Kifaru	FB	D	2000	15	January
Tsavo	TSE	Tsavo East	HB	T	3000	16	January
Tsavo	TSW	Tsavo West	FB	S	3100	18	January
Masai Mara	WBT	Wild Beast	HB	S	2100	17	January
Sarova 5 Star	SST	Sunset	FB	S	2100	18	January
Sarova 5 Star	SUS	Sun & Sands	FB	D	1700	15	January
Masai Mara	NDV	Ndovu	FB	S	1500	18	January

- a. Derive an Entity Relationship data model for the above scenario according to the following requirements:
  - i. Show Relationships and participation constraints. [5 Marks]
  - ii. Resolve Many to Many relationships. [3 Marks]
  - iii. Allocate attribute types to Entity Types using the column headers from the Table above. [2 Marks]
  - iv. Underline attributes that are Entity Identifiers. [1 Mark]
- b. Derive a set of Tables/Relations from your ER model containing the sample data above. Underline the Primary Keys in each Table. [5 Marks]
- c. Extend the ER model you produced above in part a) by adding **TWO** further Entity Types; **Customer** and **Reservation**; to allow a Customer to reserve accommodation at a hotel possibly on different dates. [4 Marks]