Adventist University of Central Africa
P.O. Box 2461 Kigali, Rwanda | www.auca.ac.rw | info@auca.ac.rw

Faculty of Information Technology
Final Exam, 2019/2020 Semester 2
Course Code: INSY 217-- Course Name: DBMS

Instructor: **Deogratias N., MSc. IT** Exam Duration: **3 hrs.**
Program: **Day** Date: ...../...../2020

INSTRUCTIONS

- *This paper comprises of **six** questions. Answer all the questions*
- *Electronic devices are not allowed*
- *Maximum score is 40*

Question#1: Multiple Choice /6 marks

1) Consider terms used in the E-R Model, what is the appropriate formal term among the following ones?
   a. Table
   b. Relation
   c. Entity
2) Consider terms used in Relational Data Model, what is the appropriate formal term among the following ones?
   a. Row
   b. Tuple
   c. Record
3) In Relational Data Model, the terminology "Degree" is:
   a. the number of tuples in a relation
   b. the number of attributes in a relation
   c. the number of a domain for one attribute
4) In Relational Data Model, an attribute, or set of attributes, that uniquely identifies a tuple within a relation is called:
   a. A candidate key
   b. A primary key
   c. A superkey
5) F.D. is compared to a Prime attribute. True or False.
6) In the F.D., if R is a relation with attributes X and Y; so, X→Y. In this case X is called:
   a) A dependent attribute
   b) A determinant set
   c) A determinant attribute

Question#2: Design a database

/6 marks

You are required to create a Final Conceptual Data Model of the data requirements for AGROVET Company that specializes in supplying farmers and veterinary products.

- The company has 25 employees and can serve at least 350 customers every week.
- The company offers two categories of products. Products are available in every province of Rwanda country.
- To every product, the code of the product, category, the name, price, fabrication_date and expiration_date must be recorded.
- AGROVET also keeps track of the identification of their employees like their names, ages, address, phone, salary, years of experience, and qualification. Each and every employee takes records related to the products sold as well as to the customer who buys.
- The information about customers like name, address and phone is recorded. Each customer may buy one or more products in week and the date will be recorded.

Question#3: Write SQL Statement

/10 marks

PRODUCT

ProdID	Category	Prod_Name	Price /Kg	Fabrication_date	EmpCode
P001	Agricultural	Fertilizer	2500	3/10/2019	EMP 101
P002	Veterinary	Tranquilizer	1200	3/01/2019	EMP 100
P003	Agricultural	Carotte seed	1800	12/212018	EMP 102
P004	Veterinary	Sedative	3000	7/19/2020	EMP 100
P005	Agricultural	Maize seed	1000	11/12/2018	EMP 102

EMPLOYEE

EmpID	LastName	FirstName	Salary	DateEmployed	Phone	DOB
EMP 100	Thadée	Ngoboka	57,000	2/8/2015	0788569020	1/2/1988
EMP 101	Keza	Isaro	43,000	1/5/2009		1/2/1996
EMP 102	Alice	Bwiza	50,000	2/12/2017	0722547877	1/2/1994

Consider data provided in the above relations, write SQL Queries to:

1) Create "PRODUCT" table using the appropriate data type for every column and adding **constraints** wherever necessary.
2) Display names and prices of all products recorded by Ngoboka.
3) Display all products by which the price per kg is between 1000 and 2000;
4) Delete the employee whose phone is unknown.
5) Calculate the total and average of salary for all our employees.

Question#4: Use Relational Algebra to answer to the following questions /4 mark

1) **By the use of relations in Question #3: PRODUCT & EMPLOYEE:**

   Write a Relational Algebra expression to list all agricultural products recorded by Bwiza

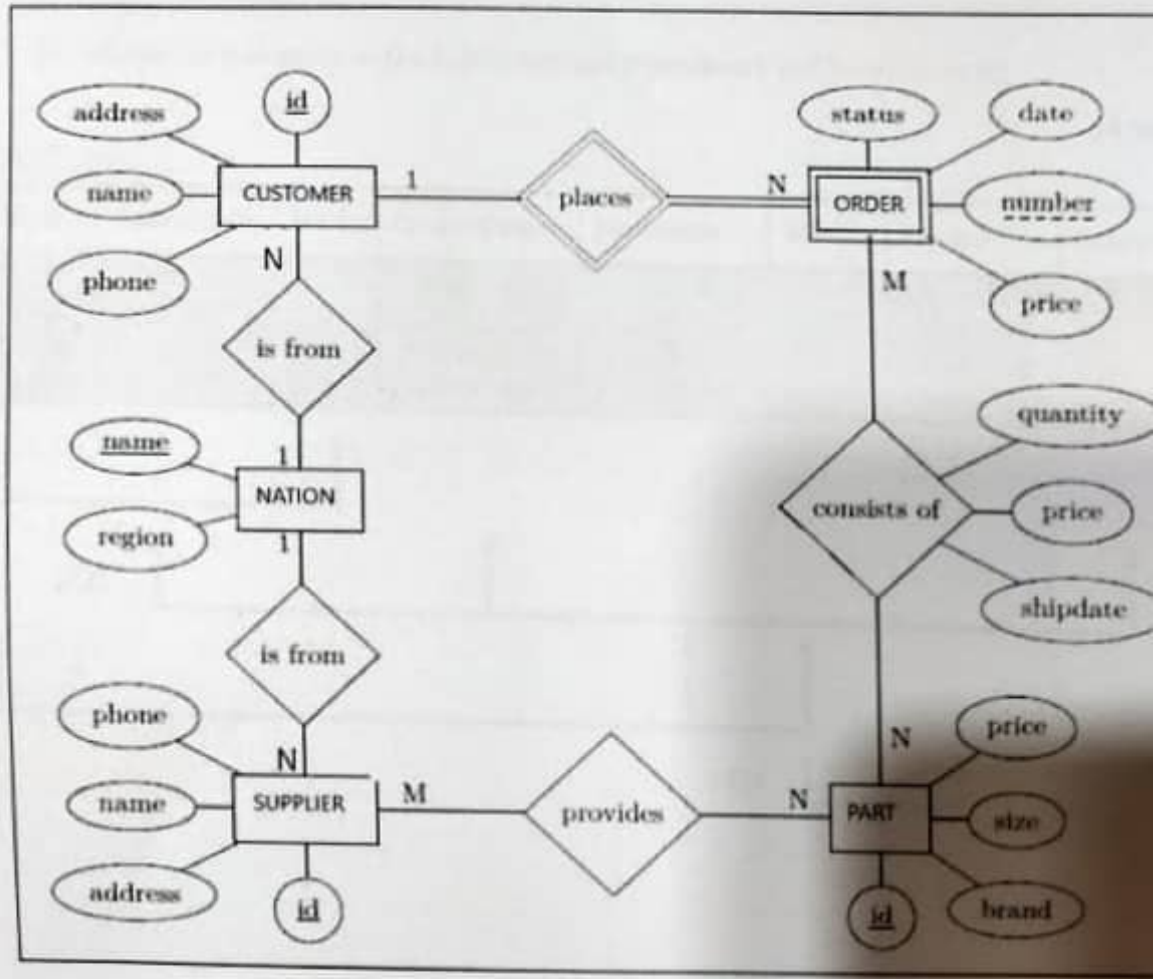
2) **Write SQL statement correspond to the following relational algebra:**

$$A \leftarrow \sigma_{(Salary<=50,000)}(EMPLOYEE)$$

$$\pi_{LastName, FirstName, EmpID}(A)$$

Question #5: Mapping /6 m

Map the following ER schema to final stage of Database schema by showing all needed relatio primary and foreign key even links between relations.



Question #6: Basic of Functional Dependencies and Normalization /8marks

6.1. Consider the following bad relation: PATIENT_DOCTOR

PatId	PatientName	DocId	DocName	TreatmentDate
P0045	Muhizi Arnold	D005	Bukara Paul	8/9/1976
P0021	Shema Papy	D005	Bukara Paul	11/23/1980
P0042	Irisa Confiance	D008	Irankunda Claudine	6/12/1985

a. Explain the update anomalies related "to insert". **/2 marks**

b. Correct the above relation by dividing it into small relations **/2 marks**

6.2. Consider the Functional Dependencies presented on the below relation 'STUDYING',

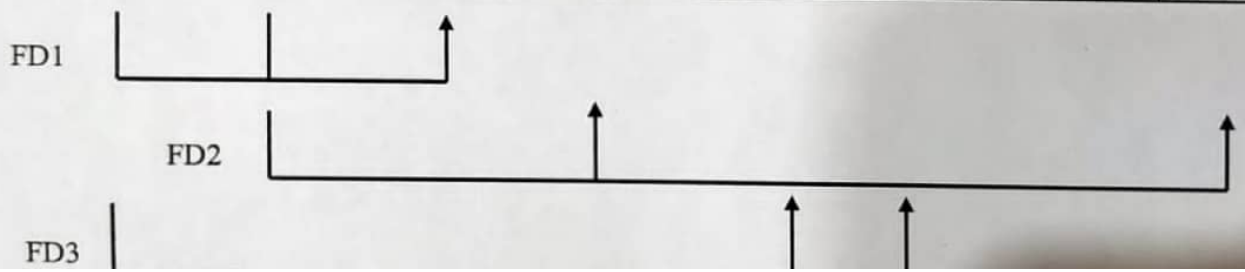
a. Normalize it into 1NF;

b. Which FD that explains the full functional dependency and how it does it?

/4 marks

STUDYING

StudID	CourseCode	Marks	CourseName	StudName	TCode	TName	CourseGroup
22100	INSY 116	13	Microcomputer	Izere Abel	T001	Munezero E.	A, E, F
21452	INSY 226	16	MIS	Seba Etienne	T001	Munezero E.	C,D
22100	MATH 111	18	Business Math	Izere Abel	T021	Theoneste H.	K, L
21452	RELT 123	16	Bible Doctrine	Seba Etienne	T010	Jerome B.	A



Question #6: Basic of Functional Dependencies and Normalization /8marks

6.1. Consider the following bad relation: PATIENT_DOCTOR

PatId	PatientName	DocId	DocName	TreatmentDate
P0045	Muhizi Arnold	D005	Bukara Paul	8/9/1976
P0021	Shema Papy	D005	Bukara Paul	11/23/1980
P0042	Irisa Confiance	D008	Irankunda Claudine	6/12/1985

a. Explain the update anomalies related "to insert". **/2 marks**

b. Correct the above relation by dividing it into small relations **/2 marks**

6.2. Consider the Functional Dependencies presented on the below relation 'STUDYING',

a. Normalize it into 1NF;

b. Which FD that explains the full functional dependency and how it does it?

/4 marks

STUDYING

StudID	CourseCode	Marks	CourseName	StudName	TCode	TName	CourseGroup
22100	INSY 116	13	Microcomputer	Izere Abel	T001	Munezero E.	A, E, F
21452	INSY 226	16	MIS	Seba Etienne	T001	Munezero E.	C,D
22100	MATH 111	18	Business Math	Izere Abel	T021	Theoneste H.	K, L
21452	RELT 123	16	Bible Doctrine	Seba Etienne	T010	Jerome B.	A