



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

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AUGUST – DECEMBER 2018 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER AND LIBRARY SCIENCE

REGULAR PROGRAMME

CMT 302: ADVANCED DATABASE SYSTEMS

Date: DECEMBER 2018

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and any other TWO Questions

- Q1. a) Differentiate between a Homogeneous Distributed Database and a Heterogeneous Distributed Database **(2 marks)**
- b) Differentiate between Discretionary Access Control and Mandatory Access Control. **(2marks)**
- c) For each of the following relational concepts, explain the key ideas behind them using your own examples... **(2 marks)**
- i) Entity Integrity
 - ii) Referential Integrity
- d) Using examples from a database application explain how the A.C.I.D. properties of database transactions assist in database integrity. **(4 marks)**
- e) Describe THREE potential mistake which could occur if concurrency control is not properly enforced in the database system. Support your answer with appropriate example for each. **(6 marks)**
- f) The database below describes the business information of an Internet company. The company sells different internet packages for a wide range of customers. Using Oracle create the tables below.

Customers Table

Customer_id int
 First_Name varchar(40)
 Last_Name varchar(40)
 Birth_Date date
 Join_Date date
 City varchar(40)
 Mobile_Phone varchar(10)
 Office_Phone varchar(10)

(3 marks)**Packages Table**

Pack_id int
 Speed varchar(10)
 Start_date date
 Monthly_payment int
 Monthly_Discount int

(3 marks)

Using Oracle database populate the tables created above:-

(3 marks)**Customer Table**

Cust omer ID	First Name	Last Name	Birth Date	Join Date	City	Mobile Phone	Office Phone
101	Kevin	Deon	31/5/1983	6/6/2013	Nairobi	724534546	20233435
102	Mary	Kamau	7/10/1982	11/3/2015	Nakuru	726555445	57877876
103	Sophie	Ikenye	23/4/1976	8/5/2014	Nairobi	733776776	20233438
104	Zari	Hassan	29/2/1980	21/4/2016	Mombasa	738768787	45776679
105	Moses	Ike	4/6/1975	29/7/2012	Kisumu	720434343	34545450

Packages Table**(3 Marks)**

Pack_id	Speed	Start_date	Monthly_payment	Monthly Discount
19	5	6/6/2013	10000	30
8	10	11/3/2015	20000	42
30	5	8/5/2014	10000	8
44	10	21/4/2016	20000	15
45	20	29/7/2012	40000	22

- Q2. a) Discuss THREE differences between Recovery using Flashback Functions and Traditional recovery method. **(5 marks)**

- b) By use of suitable examples explain how the following relational algebra operations are processed.
- i) UNION
 - ii) PROJECT
 - iii) SET DIFFERENCE
- (4 marks)**

- c) Using Oracle database created above execute the following Queries: -
- i) Display all the data from *Packages* table for packages whose speed is "5Mbps". **(3marks)**
 - ii) Display the first name, last name, package number and monthly discount for all customers with monthly discount less than 30 **(3 marks)**
 - iii) Create a query to display the last name concatenated with the first name, separated by space, and Mobile phone, Office phone separated by comma and space. Name the column heading FULL_NAME and CONTACT_DETAILS respectively. **(5 marks)**

- Q3. a) Using your own examples explain the following transaction processing concepts and their role in enforcing data integrity and consistency in an Oracle database.
- i) COMMIT
 - ii) ROLLBACK
 - iii) SAVEPOINT
- (4 marks)**
- b) Discuss the difference between Direct Path and Conventional Path loading in Oracle database. **(4marks)**
- c) Display all the data from Customers table for all customers who have the letters: *l, j* or *h* in their last name. Order the query in descending order by monthly discount **(3 marks)**
- d) Display all data from *Customers* table for:-
- i) All customers who live in Nairobi **and** whose monthly discount is in the range between 30 and 40 **or**
 - ii) All customers whose package number is not 8,19, or 30 **and** whose join date is before January 1st, 2015 **(3 marks)**
- e) For all customers display the last name, first name and email address. The email address will be composed from the first letter of first name concatenated with the last name concatenated with the string "@gmail.com" (For example: Mary Kamau → mkamau@gmail.com). **(5 marks)**

- Q4. a) By use of examples, describe what is meant by the following concurrency control methods:
i) Two-Phase Locking
ii) Serializability **(4 marks)**
- b) Discuss the difference between Range Partitioning and Hash Partitioning in Oracle database. **(5marks)**
- c) From *Customers* table, for all customers, display the first name, last name, monthly discount and a discount grade based on the following conditions:
i) If the discount is between 0 and 10 – discount grade level is A.
ii) If the discount is between 11 and 20 – discount grade level is B.
iii) If the discount is between 21 and 30 – discount grade level is C.
iv) for any other value – discount grade level is D **(3 marks)**
- d) Write a query to display first name, last name, package number and internet speed for all customers whose package number equals 22 or 27. Order the query in ascending order by last name. **(3 marks)**
- e) Display the first name, monthly discount and package number for all customers whose monthly discount is lower than the average monthly discount, and whose package number is the same as customer named “Kevin” **(5 marks)**
- Q5. a) Describe FOUR steps to decompose tables in attaining database normalization **(4 marks)**
- b) Some user has accidentally dropped one table and you realize this after two days. Discuss THREE advantages of having the DB running in ARCHIVELOG mode that will enable you recover this table. **(3 marks)**
- c) Display the package number, internet speed and monthly payment for all packages whose monthly payment is lower than the minimum monthly payment of packages with internet speed equals to “5Mbps” **(3 marks)**
- d) Display the first name, join date and the difference in years between join date and current date for all customers where today have passed exactly 5 years since they joined the company. **(5 marks)**
- e) Display the first name, monthly discount and package number for all customers whose monthly payment is greater than the average monthly payment. **(5 marks)**

END