MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

THIRD YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

CITY CAMPUS

CIT 303: ADVANCED DATABASE SYSTEMS

Date: 15th June, 2017 Time: 5.30 - 8.30 pm

INSTRUCTIONS:

- Answer question ONE and any other TWO questions.
- Maseno observes ZERO tolerance to examination cheating.

Question One

a) Today, instead or purchasing physical machines, an alternate approach to running a database management system is to run it in the cloud. One of the key promises of the cloud is the illusion of infinite resources and the ability for users to elastically grow and shrink the resource consumption of their DBMS.
Why can it be difficult to scale a relational DBMS? [6 **Marks]**

b) Indicate one approach that the so-called "NoSQL" systems take to overcome the above challenge (Why can it be difficult to scale a relational DBMS). [6 **Marks]**

c) Imagine you are a database consultant who has been asked to answer the following questions posed by a potential client. Using your own simple examples and/or any suitable diagrams show how you would address the questions posed by the client

i. What is the difference between a query, statement & transaction? [5 **Marks]**

ii. Do transactions have to conform to any rules? [5 **Marks]**

iii. What is database locking used for? [5 **Marks]**

iv. How does a database undo a mistaken change to data? [5 **marks]**

Question Two

Consider a database used to record the marks that students get in different exams of different course offerings.

i. Construct an E-R diagram that models exams as entities, and uses a ternary relationship, for the above database [8 **Marks]**

ii. Construct an alternative E-R diagram that uses only a binary relationship between *students* and *course-offerings*. Make sure that only one relationship exists between a particular student and course-offering pair, yet you can represent the marks that a student gets in different exams of a course offering. [12 **Marks]**

Question Three

a) Write the SQL CREATE TABLE statement for the **owns** relation between **Skier** and **PairOfSkis**. Make sure that your statement specifies the PRIMARY KEY and any FOREIGN KEYS. Additionally, we would like to enforce the constraint that purchase price be greater than zero. **[5 Marks]**

b) Explain why it is not always possible to perform SQL UPDATE/DELETE/INSERT statements on top of a view. [6 **Marks]**

c) Discuss two scenarios where a view can be helpful in a database management system [5 **Marks]**

d) Explain the difference between physical and logical data independence. [4 **Marks]**

Question Four

The table below lists customer/car-hire data. Each customer may hire cars from various outlets. A car is registered at a particular outlet and can be hired out to a customer on a given date.

CarReg	Make	Model	CustNo	CustName	HireDate	OutletNo	OutletLoc
W 565 CDC	Ford	Escort	C100	Smith, J.	14/5/01	21	Woodstock
W 565 CDC	Ford	Escort	C222	Patel, V.	15/5/01	21	Woodstock
V 734 HSB	Nissan	Sunny	C100	Smith, J.	14/5/01	21	Woodstock
W 104 RSM	Ford	Escort	C303	Brown, F.	14/5/01	24	Denham
W 104 RSM	Ford	Escort	C100	Smith, J.	16/5/01	24	Denham
W 611 SBH	Nissan	Sunny	C222	Patel, V.	15/5/01	24	Denham

a) The data in the table is subject to *update anomalies*. Provide examples of how *insertion, deletion, and modification* anomalies could occur on this table. **[4 Marks]**

b) Identify *the functional dependencies* represented by the data in the table. State any assumptions you make about the data. **[7 Marks]**

c) Identify the *primary* and *foreign* keys in your relations. **[3 Marks]**

d) Draw an *Entity-Relationship model* for the data in the table. Show all the entities, relationships, and attributes. **[6 Marks]**

Question Five

Consider a database consisting of a single relation R:

A	B
1	10
2	0

a) The following two transactions run concurrently on this database:

Line	T1	T2
1	Begin transaction;	Begin transaction;
2	Update R set B=B-10 where A=1;	Select sum(B) from R;
3	Update R set B=B+10 where A=2;	Commit;
4	Commit;	

Is it ever possible for T2 to see a value of zero in its output? Explain why or why not. **[10 Marks]**

b) The following two transactions run concurrently on this database: **[10 Marks]**

Line	T1	T2
1	Begin transaction;	Begin transaction;
2	Insert into R values (3, 150)	Select sum(B) from R;
3	commit	Select Sum(B) from R;
4		Commit;

Is it ever possible for T2 to see a different value as the output of the ***select sum(B) from R*** statements?