JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN ACTURIAL SCIENCE

4TH YEAR 2ND SEMESTER 2016/2017 ACADEMIC YEAR

MAIN CAMPUS (JAB)

COURSE CODE: SCS 433

COURSE TITLE: ADVANCE DATABASE MANAGEMENT SYSTEMS

EXAM VENUE: **STREAM: Bsc Acturial**

DATE: DEC 2016 **EXAM SESSION:**

TIME: 2.00 HOURS

INSTRUCTIONS:

1. **Answer Question 1 (Compulsory) and ANY other two questions**
2. **Candidates are advised not to write on the question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE [30 MARKS]

a) Explain of Database management Systems. [1 Marks]

a) The world is witnessing increasing demands on mobile computing to provide support for growing number of mobile workers. With the aid of a well labelled diagram, outline the four key components of a mobile database environment. [5 Marks]

b) For each of the following schedules, state whether the schedule is serializable, conflict serializable, view serializable, recoverable, and whether it avoids cascading aborts: [10 Marks]

i. read(T1, balx), read(T2, balx), write(T1, balx), write(T2, balx), commit(T1), commit(T2)
ii. read(T1, balx), read(T2, baly), write(T3, balx), read(T2, balx), read(T1, baly), commit(T1), commit(T2), commit(T3)
iii. read(T1, balx), write(T2, balx), write(T1, balx), abort(T2), commit(T1)
iv. write(T1, balx), read(T2, balx), write(T1, balx), commit(T2), abort(T1)
v. read(T1, balx), write(T2, balx), write(T1, balx), read(T3, balx), commit(T1), commit(T2), commit(T3)

c) Consider the following relational database called "University":

STUDENT (studentId, courseid, studentname, program, major)

COURSE (courseId, trimesterid, coursename, credithours, grade)

TRIMESTER (trimesterId, trimestername, year, instructor)

Specify the SQL queries that perform the tasks below:

d) Create the three (3) tables clearly considering their relationships through key fields. [6 Marks]

```
Create table student(
studentId varchar(20),
courseId varchar(6),
studentname varchar(50),
program varchar(40),
major varchar(30),
primary key(studentId),
foreign key(courseId) reference course(courseId)
);
Create table course(
courseId varchar(6),
trimesterid int,
coursename varchar(50),
credithours int,
grade varchar(3),
primary key(courseId),
foreign key(trimesterId) references trimester(trimesterId)
);
Create table trimester(
trimesterId int,
trimestername varchar(10),
```

```
year int,
instructor varchar(12),
primary key(trimesterId)
);
```

e) Retrieve the names of all students showing their coursename and grade. [2 Marks]

f) The Database Administrator accidentally executed an SQL statement that deleted all the entries in the STUDENT table. What SQL statement was this? [2 Marks]

g) Add an attribute called 'Points' to the COURSE table. Set it in such a manner that it cannot accept null/empty entries and that it takes floating point values. [2 Marks]

h) Create a view called StudentCourse that brings together all the three tables over the key fields. [2 Marks]

QUESTION TWO [20 MARKS]

a) Explain the following in terms of providing security for a database: [6 MARKS]

i. Access controls;
ii. Views;
iii. Integrity;
iv. Encryption;
v. RAID technology

b) The consistency and reliability aspects of transactions are due to the 'ACIDity' properties of transactions. Discuss each of these properties and how they relate to the concurrency control and recovery mechanisms. Give examples to illustrate your answer. [8 MARKS]

c) Consider a case of a Library Management System. Use it to answer the following questions:

When books are purchased and stocked in the Library with all their details recorded in the system. The Librarians have to add new books to the system catalogue by assigning a book number then recording the ISBN number, publisher, author(s) and year of publication. Students and Lecturers visit the library at any time when they can read open shelve books while in the library or borrow for a specific period of time. Whenever Students or Lecturers borrow books, the Librarian has to update the details under the borrowed books ledger where they record the student registration number or lecturer's personal file number, date of borrow, date of return. The system keeps track of the Librarian serving leasing the book i.e. Staff Id and Name. A fine payable to the Finance Clerk is charged for books returned after the expiry date before being cleared by the Librarian during which the Staff Id and Name of Finance Clerk are captured including date of payment. Similarly, in case a Student or Lecturer loses a book, they have to clear with the Finance Clerk before they are allowed to use the library again. The Chief Librarian using his/her Staff Id and Name, periodically generates

reports to analyse the operation of the library i.e. views the number of books borrowed and the return schedules. The system further keeps track of Librarians on duty basing on the fact that they operate in shifts.

i) Identify the entities involved with their respective attributes. [4 marks]

ii) Design and draw an ER diagram that captures all the information about the Library System. Use only the basic ER model; that is, entities, relationships, and attributes. Be sure to indicate any key and participation constraints. [2 marks]

QUESTION THREE [20 MARKS]

a) The ANSI-SPARC Architecture has 3 level abstractions i.e. External, Conceptual and Internal levels. Outline any three reasons why the separation is desirable. [2 Marks]

b) Explain GRANT and REVOKE privileges used in data bases security management use

Syntaxes to demonstrate your answers [6 Marks]

c) Write SQL code to join the following table using simple join statement [4 marks]

fld	Aircraft name	cname	destination
B0034	BA	Paul	London
A004	KQ	Petro	Bangalore
A005	Emirates	Kasuku	Dubai

cid	cname	salary	Hours	Fld
CA001	Paul	500,000	8	B0034
CB003	Petro	48,000	6	A004
CB002	Kasuku	80,000	8	A005

d) Write a select statement to order flight destination by salary (4 marks)

e) Do a MySQL query to sum the salaries of the three captains (4 marks)

QUESTION FOUR [20 MARKS]

a) Explain and illustrate any three relational algebra operations using appropriate examples [6 marks]

b) Explain any FOUR aggregate functions operation used in Mysql, illustrate your answer [4 Marks]

c) Explain Distributed Replication Server Functionality [4 Marks]

d) Explain Database replication in distributed databases [2 Marks]

e) DDBMS must synchronize global transaction to ensure that all sub transactions have completed successfully before recording a final COMMIT for global transaction. How does the Two-phase commit enforce database security? [4 Marks]

QUESTION FIVE [20 MARKS]

a) Differentiate between Distributed Databases and Distributed DBMSs. [5 Marks]

b) Discuss any five Advantages and Disadvantages of Distributed Database Management Systems [5 Marks]

c) List and discuss the main activities associated with each stage of the database system development lifecycle. [5 marks]

d) Discuss what is Replication servers in view of Synchronous or Asynchronous of DDMS

[5 Marks]