JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATIONS 2015/2016

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

4TH YEAR 1ST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN ACTURIAL MATHEMATICS WITH IT

MAIN – RESIT

COURSE CODE: SCS 433

COURSE TITLE: ADVANCED DATABASE SYSTEMS

EXAM VENUE: **STREAM:** Bsc. Actuarial

DATE: **EXAM SESSION:**

TIME: 2.00 HOURS

INSTRUCTIONS:

1. **Answer ALL 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) Define the following terms and concepts as applies to database systems. [4 Marks]

(i) Query processing

(ii) Database Tuning

(b) Using a suitable diagram, briefly explain the Architecture of Distributed Database Systems. [4 Marks]

(c) Give the role of Database Administrator with respect to security. [2Marks]

(d) Consider yourself the database administrator of Wanaweza Limited and you create a relation called Employees with fields *ename*, *dept* and *salary*. For authorization reasons, you also define views EmployeeNames (with *ename* as the only attribute) and DeptInfo with fields *dept* and *avgsalary*. The latter lists the average salary of each department.

(i) What privileges should be granted to a user who needs to know only the average department salaries for the **Marketing** and **Production** departments? [4 Marks]

(ii) Your secretary allows Juma to read the EmployeeNames relation and later quits. You then revoke the secretary's privileges. Explain what happens to Juma's privileges. [2 Marks]

(e) Suppose there is a relation R = ABCDE in the database. Using appropriate examples, describe how the trigger mechanism can be used to impose a functional dependency constraint on AB→C. [4 Marks]

(f) Consider a relation R=ABCDEFGH and the following set of F on functional dependencies; G →FD, E →D, GD →CE, and BD →A. Find a join loss-less, dependency preserving and Third Normal Form decomposition of R. [4 Marks]

(g) Describe the design of temporal databases and spatial databases. [4 Marks]

(h) After transaction is rolled back under the timestamps ordering protocol, it is usually assigned a new timestamps when it starts again, can it keeps its old timestamps? Explain. [2 Marks]

QUESTION TWO **[20 MARKS]**

(a) Give the goal of *query optimization* and why it is important to databases. [4 Marks]

(b) Explain the three techniques commonly used in algorithms to evaluate relational operators. [6 Marks]

(c) What is the role of *buffer manager* in a database management system? Compare its role with that of *disk space manager*? Explain. [5 Marks]

(d) When creating an *index* on a relation, there are considerations that guide the choice of the primary index. Discuss. [5 Marks]

QUESTION THREE **[20 MARKS]**

(a) "Relational algebra operators can be composed".

(i) Do you agree with this statement? Explain. [3 Marks]

(ii) Why is ability to compose operators important? [3 Marks]

(b) Consider the following schema:

Suppliers (<u>sid</u>, sname, address)

Parts (<u>pid</u>, pname, color)

Catalog (<u>sid, pid</u>, cost)

Write the query below in SQL, Relational Algebra, Tuple Relational Calculus and Domain Relational Calculus. [10 Marks]

Find the names of suppliers who supplied some yellow part.

(c) Explain the term *stored procedure*, and give examples that shows stored procedure are useful. [4 Marks]

QUESTION FOUR **[20 MARKS]**

(a) Compare and contrast "optimistic" with "pessimistic" concurrency control. [4 Marks]

(b) Discuss the criteria you would use to determine whether a given database management system implements the relational data model. [8 Marks]

(c) Compare and contrast the situations in which an object oriented database management system would be preferred to a relational database management system. [8 Marks]

QUESTION FIVE **[20 MARKS]**

(a) What is *transaction* as applies to database management system? How is it different from normal program in programming language like C, C++? [4 Marks]

(b) Explain how recovery manager ensures atomicity and durability of transactions in databases. [4 Marks]

(c) What are the considerations in determining the locking granulity when executing SQL statements? [4 Marks]

(d) Name the recovery-related steps are taken during normal execution in transactional processing. [4 Marks]

(e) Consider the relation schema R(A,B,C), which has the functional dependency $B \rightarrow C$. If A is a candidate key of R, is it possible for R to be in Boyce-Codd Normal Form (BCNF)? Explain. [4 Marks]

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