JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL INFORMATICS AND INNOVATIVE SYSTEMS

UNIVERSITY EXAMINATION FOR THE DEGREE OF SCIENCE

COMPUTER SECURITY & FORENSICS

2ND YEAR 1ST SEMESTER 2013/2014 ACADEMIC YEAR

CENTRE: MAIN

COURSE CODE: IIT 3218

COURSE TITLE: INTRODUCTION TO NUMBER THEORY

EXAM VENUE: LR 6 **STREAM: BSc. Computer Security & Forensics**

DATE: 17/12/2013 **EXAM SESSION: 11.30 – 1.30 PM**

TIME: 2 HOURS

Instructions:

1. **Answer question 1 (Compulsory) and ANY other 2 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 (COMPULSORY) **[30 MARKS]**

(a) List two benefits of using a database management system to store and access data over using a file system. [2 Marks]

(b) Differentiate between the following terms and concepts as indicated below. [8 Marks]

(i) Keys: Composite and Candidate

(ii) Attributes: Composite and Multi-valued

(iii) Database Models: Relational and Hierarchical

(iv) Integrity constraints: Domain and Entity

(c) Explain the four criteria used to classify database management system. [4 Marks]

(d) Below is a database schema in First Normal Form (1NF). Use it to answer the questions below.

1NF(Proj_No, Emp_No, Proj_Name, Emp_No, Job_Class, Chg_Hours, Hours)

(i) What do you understand by the term *normalization*? [2 Marks]

(ii) Convert the above example into Third Normal Form (3NF). [4 Marks]

(iii) In database design, denormalization can be viewed as a process of deliberately introducing redundancies to ones data. At what instance is *denormalization* justified? [2 Marks]

(e) Structured Query Language (SQL) is like a *defacto* language supported by relational database systems (RDBMS). Use a suitable example to demonstrate the use of SQL as a Data Definition Language and as a Data Manipulation Language (DML). [4 Marks]

(f) Identify TWO basic security and authorization approaches taken by Database Management Systems (DBMS) to secure database access. [2 Marks]

(g) "A database is both data portion and log partition". Do you agree with this statement? Support your answer. [2 Marks]

QUESTION TWO **[20 MARKS]**

Read the following problem scenario and use it to answer questions that follow.

The Motor vehicle Branch administers driving tests and issues driver's licenses. Any person who wants a driver's license must first take a learner's exam at any Motor Vehicle Branch in the province. If he / she fails the exam, he can take the exam again any time

after a week of the failed exam date, at any branch. If he passes the exam, he is issued a license (type = learner's) with a unique license number. A learner's license may contain a single restriction on it. The person may take his driver's exam at any branch any time before the learner's license expiry date (which is usually set at six months after the license issue date). If he passes the exam, the branch issues him a driver's license. A driver's license must also record if the driver has completed driver's education, for insurance purposes.

(a) Draw an E-R diagram using provided information. [9 Marks]

(b) Map the E-R diagram drawn in (a) above into relations. State all assumptions and underline the primary keys and denotes the foreign keys with asterisk (*).[7 Marks]

(c) Write the query below in SQL, Relation Algebra or Relational Calculus [4 Marks]

Find the drivers who took exam in the same branch and got driving license on the same day

QUESTION THREE **[20 MARKS]**

(a) Suppose that we need to maintain a database of information about KFL football games. Information to be kept includes:

For each team: name, home ground, colour scheme, captain.
For each player: name, number, current team, goals in each game, previous teams.
For each fan: name, joining year, team.
For each game: week number, teams, scores, ground, players.

(i) What functional dependencies are likely to hold between these attributes? [4 Marks]

(ii) Design relational schemas for this database. Each schema should be in 3NF or BCNF. Identify candidate keys in each relation. Note any unspecified requirements and state any assumptions needed to make the design complete and state any assumptions needed to make the design complete. [7 Marks]

(b) For each of the following relations, (i) State any reasonable assumptions or rules, in addition to those already given, (ii) Give functional dependencies based on your assumptions, and (iii) Transform each relation to 3NF or BCNF.

(i) EMPLOYEE (EMPNO, EMPNAME, SALARY, PROJECT, PROJNAME, FINISHDATE)
An employee can work on more than one project at a time.

(ii) STUDENT (STUDNO, STUDNAME, SUBJNO, SUBJTITLE, RESULT, STAFFID)

(iii) PART (PARTNO, PARTDESCR, SUPPLIERNO, SUPPLIERNAME, PRICE, DATE, QTY)

[9 Marks]

QUESTION FOUR **[20 MARKS]**

(a) "A database administrator must understand both relational theory and specific implementation of a relational database management system when creating a database". Use a suitable example to support the above statement. [2 marks]

(b) Explain any two technical database software strategies needed to be defined when establishing a usable database environment. [4 Marks]

(c) Name two risks and two benefits that an organization expects when upgrading the database software they are using. [4 Marks]

(d) "When designing a database, it is important to consider how the database will perform when applications make requests to access and modify data".

(i) Explain five factors that normally influence database performance. [5 Marks]

(ii) For each factors explained in (i) above, specify whether they are hardware or software dependent or both. [5 Marks]

QUESTION FIVE **[20 MARKS]**

(a) Masomo University intends to introduce a web enabled database service that will allow their students to access their data online. The students shall be able to access their examination results, fees payment and room booking services online. Consider yourself being approached to offer expertise assistance.

(i) Identify any two technical guidelines that will help the university implement their database. [2 Marks]

(ii) What is the expected database administrator's challenge when dealing with web-enabled databases? Explain. [2 Marks]

(iii) Cite examples of flaws that can be introduced during design phase of such web-enabled database. [3 Marks]

(iv) Give a suitable SQL syntax that is likely to be used when denying online access rights to these students. [4 Marks]

(b) Use a suitable example to demonstrate the relevance of SQL Rule of Thumb in database design and administration. [4 Marks]

(c) Give two reasons for database administrator's participation in developing metadata management strategy in an organization with a well-defined data administration function. [2 Marks]

(d) "A database administrator never requires business metadata to his / her job, and a business user never needs technology metadata". Do you agree? Explain. [3 Marks]