Regis University
School for Professional Studies

Examination Period
Spring 8 Week 1 2008

Final Examination for (a) MCT 615 Database Administration, or (b) MSCD 640 Database Administration

Completion Date: Final Examination must be completed and submitted to bblake@regis.edu no later than March 2 at 10 PM MST.

Certification of Authorship of Final Exam

Submitted to Brad Blake.

Student's Name:_____

Date of Submission:_____

Certification of Authorship: I hereby certify that I am the author of this (test) document and that any assistance I received in its preparation is fully acknowledged and disclosed in the document. I have also cited all sources from which I obtained data, ideas, or words that are copied directly or paraphrased in the document. Sources are properly credited according to accepted APA standards for professional publications. I also certify that this paper was prepared by me for the purpose of partial fulfillment of requirements for the course.

Student's (Electronic) Signature:
_____

General Directions:

(1) No work will be accepted after the completion date.
(2) Place your name and contact information on all pages of the final exam.
(3) Complete all questions on the examination.
(4) Submit the exam once in its entirety.

Question 1. **<25 points>**

What are the essential concerns, duties, and elements of database administration with respect to the database management system and the physical database?

Write a 1500 word essay on the above question. Given a bifurcation of responsibilities between administering and managing the database management system (instance), and the physical database, formulate a database administration plan that details the activities, concerns, duties, and elements associated with: a) instance management, b) schema management, c) storage management, and d) security management. Introduce each area of administration, define it, and discuss the associated activities, tools, duties, concerns, relevance, and safeguards in each area. Your response should include specifics related to the Oracle 10g database system with a parallel discussion of the negative impact of negligent administration in each area.

Question 2. Storage **<25 points>**

(a) Evaluate and explain two of the key factors that determine the reliability of storage media. (5 points).
(b) Compare and contrast the following two methods for reducing the risk associated with physical failure of storage media: (file) disk multiplexing and RAID. (5 points).
(c) One method for reducing disk I/O is to maintain as many blocks as possible in primary storage. Analyze by example and explain the role of buffers and responsible subsystems in managing the allocation of space available in main memory for the storage of blocks. (5 points).
(d) Differentiate between logical and physical storage in the Oracle database system. Evaluate by example and explain the relationship between tablespaces and physical data files. (5 points).
(e) How does the remapping of bad sectors by disk controllers affect data-retrieval rates? Support your answer by example. (5 points).

Question 3. **<25 points>**

Part 1. Indexing

Given that a relation is stored in a B^+ -tree file organization. Suppose secondary indices stored record identifiers that are pointers to records on disk:

(a) What would be the effect on the secondary indices if a page split happens in the file organization? (2.5 points)

(b) What would be the cost of updating all affected records in a secondary index? (2.5 points)
(c) How does using the search key of the file organization as a logical identifier solve this problem? (2.5 points)
(d) What is the extra cost due to the use of such logical record identifiers? (2.5 points)

Part 2. Transaction Management

(a) The consistency and reliability aspects of transactions are due to the "ACIDity" properties of transactions. Discuss each of these properties and explain how they relate to the concurrency control and recovery mechanisms. Give examples to illustrate your answer. (5 points)
(b) Evaluate and explain the types of problems that can occur in a multi-user environment when concurrent access to the database is allowed. (5 points)
(c) Why would two-phase locking not be an appropriate concurrency control scheme for indexes? Explain and then discuss a more appropriate locking scheme for tree-based indexes. (5 points)

Question 4 **<25 points>**

Object-Relational Databases

(a) Fully explain what is intended in the following syntax (5 points):

```
CREATE ROW TYPE employee_type  (
  ename  VARCHAR(25),
  ssn       CHAR(9),
  salary   INT) ;

CREATE ROW TYPE engineer_type (
  degree  VARCHAR(10),
  license VARCHAR(20))
  UNDER employee_type ;

CREATE ROW TYPE engr_mgr_type (
  manager_start_date     DATE
  dept_managed VARCHAR(20))
  UNDER engineer_type ;
```

A proof is a formal method for proving or disproving some particular phenomena.

(b) In this case, you are asked to prove that DML can transact against column object data. Formulate and present all relevant code for the proof and the subsequent output from the Oracle DBMS to reach conclusions in the proof. (5 points)

(c) In this case, you are asked to prove that DML can transact against row object data. Formulate and present all relevant code for the proof and the subsequent output from the Oracle DBMS to reach a conclusion in the proof. (5 points)

(d) In this case, you are asked to prove that DML can transact against VARRAY data. Formulate and present all relevant code for the proof and the subsequent output from the Oracle DBMS to reach a conclusion in the proof. (5 points)

(e) In this case, you are asked to prove that DML can transact against nested table data. Formulate and present all relevant code for the proof and the subsequent output from the Oracle DBMS to reach a conclusion in the proof. (5 points)