Summer Examinations 2015

CSY303315N

Module Title: Advanced Databases
Level: Six
Time Allowed: Two hours

Instructions to students:
- Enter your student number not your name on all answer books.
- Answer any three questions.
- Begin each question in a separate answer book; label each answer book clearly with the number of the question you are answering.
- The use of a non-programmable calculator is permitted.

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Answer any **three** questions.

**Question 1**

a. Apply **Two Phase locking** to the schedule below and clearly identify the outcome of each transaction.

   (16 marks)

b. Apply **Time Stamping** to the schedule below and clearly identify the outcome of each transaction.

   (17 marks)

Schedule:
T1 Read users, T1 Read access_rights, T2 Read access_rights,
T1 Write adjustments, T2 Read adjustments, T3 Read adjustments,
T2 Write users, T3 Read users, T3 Write access_rights

Total: 33 marks

**Question 2**

a. Discuss the application of indexes within databases, their appropriate selection and the differences between **dense** and **sparse** indexes. Use examples to illustrate your answer.

   (28 marks)

b. Assuming a customer’s table already has a primary key, propose a column(s) that may benefit from a secondary index and write the SQL command to create that index.

   (3 marks)

c. Write the SQL command that would show your index from (b) and the other indexes on the customers table.

   (2 marks)

Total: 33 marks
Question 3

Database programming uses procedural commands to build and store server side functions and procedures.

a. **Collection Types** may be useful tools within database programming. Discuss the key collection types and their use with bulk binds. Provide examples of how they are used in PL/SQL.

   (15 marks)

b. Packages are programming units that logically group together sub-programmes. Explain the term *package* in the context of PL/SQL, illustrating your answer with appropriate examples and discuss the advantages of using packages in database programming.

   (18 marks)

**Total: 33 marks**

Question 4

Assume an empty B+ - Tree $n=7$

a. Determine the following for each node other than the root node:

   - The maximum number of pointers?
   - The maximum number of key entries?
   - The minimum number of pointers?
   - The minimum number of key entries?

   (4 marks)

Assume an empty B+ - Tree $n=4$

The following entries are added and deleted to the tree in the sequence below:

- Stage 1: ike, graham
- Stage 2: martha, brian, julliet
- Stage 3: lisa, bobby, carl
- Stage 4: edward, adrian
- Stage 5: REMOVE carl and martha

b. Draw the state of the tree generated by the insertions at all 4 stages. Later stages include previous stages e.g. stage 4 includes, 1, 2, 3 and 4.

   (29 marks)

**Total: 33 marks**