Spring Examinations 2013/ 2014

Exam Code(s)	3BCT
Exam(s)	3rd year Information Technology and Computer Science
Module Code(s)	CT332
Module(s)	Database Systems II
Discipline(s)	Information Technology
Internal Examiner(s)	Dr. Michael Madden Dr. Colm O'Riordan*
External Examiner(s)	Prof. John Power
No. of Pages	3 (including cover sheet)
Duration	2 hours
Instructions:	Answer any three questions

PTO

Q.1.

i) Find a minimal cover set of functional dependencies for the following set:

{AB -> D, B -> CG, A -> D, D -> EF, C->G}

Explain the steps you take. (12)

ii) De-normalisation of a relational database schema is sometimes adopted. Explain, with examples, the motivation for different types of denormalisation. (11)

iii) Given a ternary relationship between three entities A, B, C with two relationship attributes (x,y), explain how you would map the relationship to i) a relational schema and ii) an object-oriented schema. (10)

Q.2.

i) Describe, briefly, a suitable non-parallel algorithm to physically sort the tuples in a large relation. (11)

ii) Assuming a parallel architecture with N nodes each with equal computation power, describe how you could implement a sort algorithm using the capabilities of the parallel architecture. Comment on the suitability and efficiency of your algorithm. (11)

iii) Explain what is meant by a *grid-file*. Explain briefly the efficiency of searching for matches on two attributes indexed using a grid-file. (11)

Q.3.

i) Discuss the advantages of a B+ tree over a B tree. Show how a B+ tree would develop given the following key values to be inserted. You may assume the tree has order 3.

12, 7, 14, 21, 23, 9, 13 (13)

ii) Describe the main features of *deductive databases.* (8)

iii) Explain, with examples, how the relational algebra operators (project, intersection and join) can be captured in Datalog. (12)

Q.4.

i) With respect to concurrency control, explain what is meant by the *temporary update problem*. Give an example of a schedule that has the *temporary update problem.* Show that the schedule is not conflict-serializable. (9)

ii) Outline a suitable mechanism to guarantee conflict serializability. Apply that mechanism to the schedule in part i) and show that the resulting schedule is conflict-serializable. (13)

iii) Outline the recovery process for a system operating under the immediate update protocol. Your answer should include an outline of the necessary entries in the system log. (11)