Spring Examinations 2014/2015

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)	Dr. John Power
No. of Pages	3 (including cover sheet)
Duration	2 hours
Instructions:	Answer any three questions

PTO

Q.1.

i) Given a binary relationship between two entities, show, with suitable examples, how you would map this relationship to suitable schemas for i) a relational database model and ii) an object-oriented database model. (10)

ii) Outline an algorithm to generate a suitable relational schema given an initial relation comprising all attributes R and a set F comprising all functional dependencies over the attributes R. What properties does your final schema have? (12)

iii) What is meant by the *non-additive join* property? Outline an approach to test whether a decomposition D into relations R1 and R2 has the non-additive join property. Illustrate your approach with suitable examples. (11)

Q.2

i) The join operator is a commonly used operator in a relational algebra. Outline an efficient algorithm to implement a join between two relations *R* and *S*. Discuss the efficiency of the algorithm. (11)

ii) Assuming a parallel architecture with N nodes each with equal computation power, describe how you could implement a join algorithm using the capabilities of the parallel architecture. Comment on the efficiency of your algorithm. (12)

iii) In the context of distributed databases, outline an approach to efficiently join two relations that are stored at two different sites. (10)

Q.3.

i) Describe the structure of a B+ tree. Outline an algorithm for inserting values into a B+ tree; illustrate the operation of your algorithm with suitable examples. Discuss briefly how deletion from a B+ tree might proceed. (12)

ii) Explain what is meant by a *grid-file*. Explain briefly the efficiency of searching for matches on two attributes indexed using a grid-file. (10)

iii) Explain what is meant by *linear hashing*. Outline a suitable algorithm to illustrate the operation of inserting values into a dynamic file via linear hashing. (11)

Q.4

i) Time stamping is a suitable approach to guarantee conflict-serializability in database systems. Explain what is meant by conflict-serializability and show how timestamping guarantees conflict serializability. (11)

ii) In a distributed database environment, database items may be spread across many sites. Outline a distributed procedure to ensure correct concurrent access to database items. (11)

iii) For a system operating under the immediate update protocol, explain the main entries that are stored in the system log. Explain how the recovery process might proceed. (11)