NUI Galway
OÉ Gaillimh

Semester 1 Examination 2017/2018

Exam Code(s)	3BCT1, 1EM1
Exam(s)	3rd B.Sc. (Information Technology) Erasmus
Module Code(s)	CT3532
Module(s)	Database Systems 2
Paper No.	1
Repeat Paper	
External Examiner(s)	Dr. Jacob Howe
Internal Examiner(s)	Dr. Michael Schukat Dr. Colm O'Riordan*
Instructions:	Candidates should answer any **Three** questions All questions carry equal marks.
Duration	2 hours
No. of Pages	3

Requirements:
MCQ
Handout
Statistical/ Log Tables
Cambridge Tables
Graph Paper
Log Graph Paper
Other Materials

Release to Library: No

Q.1

(a) Explain what is meant by the term *minimal cover set.* Illustrate an approach to generate a minimal cover set from the following set of functional dependencies:

F = {x -> y, x->z, xy->w, y->z}. (8)

(b) Define the term non-additive join. Show, with a suitable example, how you would check if a decomposition of a relation *R* into *R1* and *R2* has the non-additive join property. (8)

(c) Given the following relation *R* and set of functional dependencies *F*, decompose *R* into relations that satisfy Boyce-Codd normal form.

R = (A,B,C,D,E,F,G,H,I,J)
F = { {A,B,C}→{D,E,F}, {A,B}→{G}, {A,C} → {J},
{C} →{H}, {H}→{I},{J} →{C} } (9)

Q.2

(a) Linear hashing is one approach to hashing values to a dynamically changing file. Briefly outline this approach and illustrate the approach using the following record key values. You may assume that each block can contain two records and that the initial file contains two blocks.

29, 28, 49, 43, 26, 11 (8)

(b) Outline an algorithm for deleting an item from a linearly hashed file. (8)

(c) Describe the structure of a B+tree. Explain, with an example, how insertion into a B+tree operates. (9)

Q.3

(a) Explain, with an example, the *temporary update problem*. (4)

(b) Explain the term conflict-serializability. Outline an approach to guarantee conflict serializability among a set of concurrently running transactions. Illustrate the approach on the example schedule you used in part (a). (7)

(c) Prove that the approach outlined in b) guarantees conflict serializability. (7)

(d) With respect to recovery, explain the notion of a *commit point* of a transaction and its role in recovery for a system operating under an immediate update protocol. (7)

Q.4.

(a) Sorting is a common operation in database systems; outline an efficient algorithm for sorting large quantities of data where the size of the data is too large to store in memory. (8)

(b) Explain how such a sorting approach can be extended to work on a parallel architecture where N machines are available to perform the processing. (8)

(c) Outline different approaches to partitioning a large relation across N disks and discuss their suitability for handling batch processing and point and range queries. (9)