



Autumn Examinations 2018

Course Instance Code(s)	3BCT1, 1EM1
Exam(s)	3 rd B.Sc. (Information Technology) Erasmus
Module Code(s)	CT3532
Module(s)	Database Systems 2
Paper No.	1
External Examiner(s)	Dr. Jacob Howe
Internal Examiner(s)	Professor Michael Madden *Dr. Colm O'Riordan

Instructions: Answer 3 questions. All questions carry equal marks.

Duration	2 hours
No. of Pages	2
Discipline(s)	Information Technology
Course Co-ordinator(s)	Dr. Desmond Chambers

Requirements:

Release in Exam Venue Yes ☐

Handout	None
Statistical/ Log Tables	None
Cambridge Tables	None
Graph Paper	None
Log Graph Paper	None
Other Materials	None

PTO

Q.1.

- (a) Given the following relation, R, and functional dependencies, F, decompose the relation such that the resulting relations satisfy BCNF.

$R = \{A, B, C, D, E, F, G\}$

$F = \{ \{A, B, C\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{E\} \rightarrow \{G\}, \{D\} \rightarrow \{A\} \}$

(10)

- (b) With respect to functional dependencies explain the following terms: *Armstrong's axioms, closure, cover set*. (6)
- (c) Outline an algorithm to generate a minimal cover set. Illustrate, with a suitable example, how your algorithm operates. (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 the types of problems that arise without correct concurrency control mechanisms. (7)
- (b) Explain the term conflict-serializability. Describe in detail an approach to guarantee conflict serializability among a set of concurrently running transactions. (10)
- (c) 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. (8)

Q.4.

- (a) Outline different approaches to partitioning a large relation across N disks and discuss their suitability for handling both point and range queries. (9)
- (b) The join operator is a very common operator in relational database queries. Outline an efficient algorithm for sorting large quantities of data where the size of the data is too large to store in memory. (8)
- (c) Outline an approach to performing a parallel join where the data is distributed across several separate machines. (8)