



TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

UNIVERSITY EXAMINATION FOR:
BACHELOR OF TECHNOLOGY/SCIENCE IN INFORMATION TECHNOLOGY
(BTIT 11M – Y4 S1/BSIT 12J – Y3 S1)

EIT 4406/ICS 2404: ADVANCED DATABASE SYSTEMS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2014

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions.

Attempt question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **TWO** printed pages

Question One (Compulsory)

- a) Define the following terms:
- (i) Distributed Database. (2 marks)
 - (ii) Distributed Database Management System. (2 marks)
 - (iii) Multidatabase Systems (2 marks)
 - (iv) Query optimization (2 marks)
- b) Explain the following database security terms:
- (i) Authentication (2 marks)
 - (ii) Backup (2 marks)
 - (iii) Encryption (2 marks)
- c) List any FOUR functions of a Distributed DBMS. (4 marks)
- d) It has been said that 2-phase locking ensures serialisability of concurrent transaction but does not ensure freedom from deadlock:
- (i) Explain the term serialisability (4 marks)

(ii) Show how deadlock can occur when using the 2-phase locking protocol. (4 marks)

e) Explain the difference between Deadlock Prevention and Deadlock Resolution. (4 marks)

Question Two

a) Describe how the use of roles can help the DBA in the management of security on a database. (8 marks)

b) Explain how the use of views can implement row and column security. Show how a view can mask out data from a table when it is queried. (4 marks)

c) Imagine you are the DBA responsible for the operation of a large database which performs on-line transaction processing and requires up to the minute recovery from failure. The database is in use during normal working hours and (owing to a restriction on finances) there is no mirroring of disks or hardware available.

The time is 15:30 on a Friday afternoon and a disk head crash occurs, the result of which is the total and permanent loss of all database data on that device:

Outline what steps that should be taken in this situation both BEFORE and AFTER the event. Your answer should include details of what help the database management system itself would give in your duties. (8 marks)

Question Three

a) Give a precise definition of a database transaction. (2 marks)

b) The ANSI standards committee has specified transaction behavior on a database according to the ACID principle. Describe the ACID principle and how it relates to database transactions. (4 marks)

c) When processing concurrent transactions, most DBMS ensure that each transaction adheres to the 2-phase locking protocol. Describe this protocol and how it governs:

(i) When locks are acquired by a transaction. (2 marks)

(ii) When locks are released by a transaction (3 marks)

(iii) Explain how 2-phase locking helps to prevent cascading rollbacks. (4 marks)

d) Discuss how deadlock can be detected and handled once it occurs. (6 marks)

Question Four

a) Describe the following terms as used in database systems:

(i) Threat

(ii) Database security

(iii) Digital certificate

(6 marks)

b) List the main types of threat that could affect a database system. (7 marks)

c) For each threat listed above, describe the controls that you would use to counteract each of them. (7 marks)

Question Five

a) Describe optimization as applied in database technology? (5 marks)

b) Describe possible methods and tools that can be used during optimization? (10 marks)

- c) Explain the advantage of database optimization and provide possible examples to support your statements. **(5 marks)**