



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF COMPUTING AND INFORMATICS

DEPARTMENT OF COMPUTER SCIENCE

QUALIFICATION: BACHELOR OF COMPUTER SCIENCE HONOURS (INFORMATION SECURITY)	
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COURSE: Database Security and Data Protection	COURSE CODE: DSD821S
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DURATION: 3 hours	MARKS: 100

SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	MR. ISAAC NHAMU
MODERATOR:	DR. AMELIA PHILLIPS

THIS QUESTION PAPER CONSISTS OF 5 PAGES
(Excluding this front page)

INSTRUCTIONS

1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.
4. When answering questions you should be guided by the allocation of marks in []. Do not give too few or too many facts in your answers.

PERMISSIBLE MATERIALS

1. Non programmable Scientific Calculator.

SECTION A (Multiple Choice questions – 10 marks)

- a. A consistent database is ____.
- A. one in which all tables have foreign keys
 - B. one in which all data integrity constraints are satisfied
 - C. one in which all tables are normalized
 - D. one in which all SQL statements only update one table at a time
- b. A single-user database system automatically ensures ____ of the database, because only one transaction is executed at a time.
- A. serializability and durability
 - B. atomicity and isolation
 - C. serializability and isolation
 - D. atomicity and serializability
- c. What is a rule that applies to the two-phase locking protocol?
- A. Two transactions cannot have conflicting locks.
 - B. No unlock operation can precede a lock operation in a different transaction.
 - C. No data is affected until all locks are released.
 - D. No data is affected until the transaction is in its locked position.
- d. All transactions must display ____.
- A. atomicity, consistency, and durability
 - B. durability and isolation
 - C. consistency, durability, and isolation
 - D. atomicity, durability, consistency, and isolation
- e. The information stored in the ____ is used by the DBMS for a recovery requirement triggered by a ROLLBACK statement, a program's abnormal termination, or a system failure such as a network discrepancy or a disk crash.
- A. data dictionary
 - B. metadata
 - C. rollback manager
 - D. transaction log

- f. ____ are more detailed and specific than policies and describe the minimum requirements of a given DBA activity.
- A. Guidelines
 - B. Standards
 - C. Procedures
 - D. Documentation
- g. Some common physical security practices found in large database installations include secured entrances, password-protected workstations, ____, closed-circuit video, and voice-recognition technology.
- A. drug testing
 - B. fingerprinting
 - C. electronic personnel badges
 - D. retina scans
- h. One of the important functions provided by the database ____ is to reserve the resources that must be used by the database at run time.
- A. security component
 - B. authorization manager
 - C. initialization parameters
 - D. administrator
- i. A ____ is a named collection of database access privileges that authorize a user to connect to the database and use the database system resources.
- A. user
 - B. role
 - C. profile
 - D. manager
- j. A(n) ____ phase in a two-phase lock is when a transaction releases all locks and cannot obtain any new lock.
- A. growing
 - B. shrinking
 - C. locking
 - D. unlocking

SECTION B

Question 1

- a. Traditionally the objectives of securing data are defined using the C-I-A triad i.e. confidentiality, Integrity and availability. Describe 3 other elements that are key to the protection of data in electronic system. [6]
- b. Differentiate between Validation and Verification. [2]
- c. Give one technique for validation and one for verification. [2]

Question 2

- a. Database Triggers are a mechanism that is standard functionality in any database, They come in two types, table level and system level, and can audit both DML and DDL transactions. Outline at least four advantages three disadvantages of using database triggers for auditing. [14]
- b. Outline three ways by which database views can protect data in a database. [6]

Question 3

Create and document a written password policy to be given out to database users in an organization. [10]

Question 4

- a. An individual may prefer to deal anonymously or pseudonymously with an organisation for various reasons, give at least 4 reasons why this can occur. [4]
- b. With regards to personal information what do the following mean:
 - i. Implied consent
 - ii. Express consent
 - iii. Bundled consent [6]

Question 5

- a. What is the access control objective for a Statistical Database (SDB) system? [1]
- b. One method of preventing inference attacks on an SDB system is to enforce query size restrictions. A query-set size control is used to limit the number of records that must be in the result set of a query. Give three shortfalls of this technique. [6]
- c. Using a diagram illustrate the following:
 - i. Data Perturbation
 - ii. Output Perturbation. [4]
- d. One way of implementing Data Perturbation is to use Data Swapping. Given the table Students below use Data Swapping to implement data Perturbation. [4]

Sex	Major	GP
Male	Bio	4.0
Male	CS	3.0
Male	EE	3.0
Male	Psy	4.0
Female	Bio	4.0
Female	CS	3.0
Female	EE	3.0
Female	Psy	4.0

Question 6

- a. One solution to the concurrency problems is locking but this produces deadlocks. What is a deadlock? [1]

- b. Produce a wait-for-graph for the following transaction scenario and determine whether deadlock exists. [14]

<i>Transaction</i>	<i>Data item locked by transaction</i>	<i>Data items transaction is waiting for</i>
T ₁	X ₂	X ₁ , X ₃
T ₂	X ₃ , X ₁₀	X ₇ , X ₈
T ₃	X ₈	X ₄ , X ₅
T ₄	X ₇	X ₁
T ₅	X ₁ , X ₅	X ₃
T ₆	X ₄ , X ₉	X ₆
T ₇	X ₆	X ₅

- c. For each of the following schedules, state whether it is conflict-serializable and/or view-serializable or none. The actions are listed in the order they are scheduled, and prefixed with the transaction name. [10]
 - a. T₁:R(X) T₂:R(X) T₁:W(X) T₂:W(X)
 - b. T₁:W(X) T₂:R(Y) T₁:R(Y) T₂:R(X)
 - c. T₁:R(X) T₂:R(Y) T₃:W(X) T₂:R(X) T₁:R(Y)
 - d. T₁:R(X) T₁:R(Y) T₁:W(X) T₂:R(Y) T₃:W(Y) T₁:W(X) T₂:R(Y)
 - e. T₁:R(X) T₂:W(X) T₁:W(X) T₃:W(X)

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