PAN AFRICA CHRISTIAN UNIVERSITY

BACHELOR OF SCIENCE INFORMATION TECHNOLOGY

END OF SEMESTER EXAMINATION

DEPARTMENT:	**COMPUTING AND INFORMATION TECHNOLOGY**
COURSE CODE:	**BSIT408**
COURSE TITLE:	**ADVANCED DATABASE MANAGEMENT**
CAMPUS:	**ROYSAMBU**
EXAM DATE:	**MONDAY,XXXX,APRIL,2026**
TIME:	**8:00AM -10:00AM**

INSTRUCTIONS

- This exam script has **TWO (2)** sections.
- Read all questions carefully before attempting.
- Answer All questions in Section **A** and any other Three questions in Section **B.**
- Write only your **student number** on the answer booklet provided.

SECTION A
(Answer ALL questions in this section)

Question One (15 marks) Compulsory

a) Citing appropriate examples, define the following terms as used in databases: **[3 Marks]**

i. Transaction

ii. Deadlock

iii. Concurrency control

b) Distinguish between homogenous and heterogeneous DDBMS. **[2 Marks]**

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c) Explain the meaning of "ACID properties of transactions." **[4 Marks]**

d) Identify the following deadlock avoidance algorithms;

i. When transaction Ti requests a data item currently held by Tj, Ti is allowed to wait only if it has a timestamp larger than that of Tj (that is, Ti is younger than Tj). Otherwise, Tj is rolled back (Tj is wounded by Ti). **[1 Mark]**

ii. When transaction Ti requests a data item currently held by Tj, Ti is allowed to wait only if it has a timestamp smaller than that of Tj (that is, Ti is older than Tj). Otherwise, Ti is rolled back (dies). **[1 Mark]**

e) " ETL is a 3-step process." Justify this statement. **[3 Marks]**

f) Highlight one challenge that may be encountered as a result of poor database design.

[1 Mark]

SECTION B
(Answer any THREE (3) questions in this section)

Question Two (15 Marks)

a) State three differences between OLTP and OLAP. **[3 Marks]**

b) Using a well labelled diagram, describe the three-schema architecture . **[6 Marks]**

c) Describe the following database structures; **[6 Marks]**

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i. Hierarchical Structure

ii. Network Structure

iii. Relational Structure

Question Three (15 Marks)

a) "A data warehouse is subject-oriented, integrated, time-variant and non-volatile."

i. Define the term data warehouse. **[1 Mark]**

ii. Using an example, explain what is meant by these terms. **[4 Marks]**

b) Using an appropriate diagram, explain each of the stages of a state transition of a transaction and indicate the direction of the transition at each stage. **[10 Marks]**

Question Four (15 Marks)

a) Describe the four components of a distributed database system. **[4 Marks]**

b) Consider the two transactions Tx and Ty below performing read/write operations on Bank Account A that has an initial balance of Kshs. 300:

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Time	T_x	T_y
t_1	READ (A)	—
t_2	A = A + 50	—
t_3	WRITE (A)	—
t_4	—	READ (A)
t_5	SERVER DOWN ROLLBACK	—

i. Explain how the above interleaving of Tx and Ty can lead to the dirty read problem.

[5 Marks]

ii. Describe how the problem in question (a) above can be fixed using locks. Show where the lock(s) should be placed. **[6 Marks]**

Question Five (15 Marks)

a) A mobile company wishes to design systems which are distributed in offices countrywide. State three factors they will consider for the effective working of their systems. **[3 Marks]**

b) XYZ University intends to develop an online examination processing system. The system will enable the students to remotely access their results. Among other requirements security is considered to be a very crucial component of the system. Using the above scenario answer the following questions:

i. Citing examples, explain two objectives in designing a secure system.

[4 Marks]

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ii. Discuss four major security threats that might face the system and for each threat state a countermeasure. **[8 Marks]**

Question Six (15 Marks)

a) In query processing, it takes various steps for fetching the data from the database.

i. Define the term query processing. **[1 Mark]**

ii. Discuss the typical phases of query processing. **[6 Marks]**

b) Use the relations given to answer the questions.

Employees

Emp – id	f – name	I – name	dept – id
1000	Calvin	Kevin	001
1001	Dennis	John	002
1002	Alice	Maina	002
1003	Bandy	Bioces	003

Department

dept – id	dept – name
001	ICT
002	FINANCE
003	PROCUREMENT

i. Write an SQL query that would give the following result: **[4 Marks]**

f - name	I – name	dept – name
Calvin	Kevin	ICT
Dennis	John	FINANCE
Alice	Maina	FINANCE
Bandy	Brocks	PROCUREMENT

ii. Write an SQL query that would give the following result: **[4 Marks]**

f - name	I – name	dept – name
Alice	Maina	FINANCE
Bandy	Brocks	PROCUREMENT
Calvin	Kevin	ICT

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Dennis	John	FINANCE

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