

PAN AFRICA CHRISTIAN UNIVERSITY

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

END OF SEMESTER EXAMINATION

DEPARTMENT: COMPUTING AND INFORMATION TECHNOLOGY

COURSE CODE: BSIT408

COURSE TITLE: ADVANCED DATABASE MANAGEMENT

CAMPUS: ROYSAMBU

EXAM DATE: TUESDAY, XXXX, APRIL, 2025

TIME: 2:30PM-5:30PM

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 1:

a) Transactions usually cannot be nested inside one another. Explain. **[2**

Marks]

b) Concurrency is the process of managing simultaneous operations on the database without having them interfere with one another. While concurrency improves the performance of a database, it comes with its own problems. Outline two problems associated with concurrency. **[2**

Marks]

c) The following are SQL statements. Use them to answer the question that follows.

```
Create Table (Staffno varchar(5), Lname(varchar(15), salary
decimal((7,2);
INSERT to STAFF ('ST678', 'Lenny' "15700");
SELECT staffno,lastname,salary
From staff
Where salary>10000;
```

Identify and correct the errors found in the statements. **[2**

Marks]

d) Identify the following deadlock avoidance algorithms;

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

Mark]

ii. When transaction T_i requests a data item currently held by T_j , T_i is allowed to wait only if it has a timestamp smaller than that of T_j (that is, T_i is older than T_j).

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Otherwise, Ti is rolled back (dies).

[1 Mark]

e) With reference to the tables below, explain referential integrity.

[2

Marks]

Enrl No	Roll No	Name	City	Mobile
11	17	Ankit Vats	Nairobi	9891663808
15	16	Vivek Amos	Kisumu	9891468487
6	6	Vanita	Nakuru	
33	75	Brian	Nairobi	9810618396

Student

Roll No	Course	Grade
6	C	A
17	VB	C
75	VB	A
6	DBMS	B
16	C	B

Grade

SECTION B

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

Question 2:

a) The ACID properties of transactions are a standard set that ensures that database transactions are processed reliably. Using an example, explain how simple transactions can lead to an undesirable outcome without adhering to the concept of atomicity.

[4

Marks]

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b) The following are tables named customer and order respectively. Use them to answer the question that follows.

CustomerID	Name	Address	Age	Salary
C/001	Ali	788 NRB	45	40,000
C/002	Anne	2000 KSM	75	30,000
C/003	Mathew	3412 NRB	25	33,000
C/004	Deborah	4222 NR	33	22,000
C/005	Antony	7243 MA	22	10,000

Customer

OrderID	Date	CustomerID	Amount
O/0001	24/12/2012	C/003	20,000
O/0002	23/05/2014	C/003	30,000
O/0003	20/07/2014	C/002	40,000
O/0004	20/02/2014	C/004	5,000

Order

State the output when the following SQL statements are applied on the tables.

- i. Select ID, name, amount, date from Customer inner join Order on
CustomerID=Order.CustomerID

[3

Marks]

- ii. Select customerID,name,amount from Customer full join Order on
CustomerID=Order.CustomerID

[3

Marks]

Question 3:

a) "A database link connection is one-way". Give reasons supporting or disapproving the statement.

[4

Marks]

b) Consider the following log;

LogID	TxID	Time	Operation	Object
1	T1	8:15	START	
2	T1	8:16	UPDATE	Account 122
3	T2	8:16	START	
4	T2	8:19	INSERT	Account 145
5	T2	8:20	DELETE	Account 153
6	T2	8:21	UPDATE	Customer 89
7	T3	8:21	START	
8	T1	8:21	COMMIT	
9		8:23	CHECKPOINT	T2, T3
10	T2	8:24	COMMIT	
11	T3	8:25	INSERT	Customer 46

Describe what needs to be done for each of the transactions T1, T2 and T3 in the case of a server crash just after LogID = 11 is created. **[6**

Marks]

Question 4:

a) "A data warehouse is subject-oriented, integrated, time-variant and non-volatile."
Using an example, explain what is meant by these terms. **[4**

Marks]

b) Using an example, illustrate how the introduction of the two-phase locking (2PL) lead to deadlock as two transactions attempt to update a data item. **[6**

Marks]

Question 5:

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

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	—

a) Explain how the above interleaving of T_x and T_y can lead to the dirty read problem.

[4

Marks]

b) Describe how the problem in question (a) above can be fixed using locks. Show where the lock(s) should be placed.

[6

Marks]

Question 6:

a) A mobile company wishes to design systems which are distributed in offices countrywide. State two factors they will consider for the effective working of their systems.

[2

Marks]

b) A medical surgery keeps patients' records in a database server located in a dedicated room. These records can be accessed remotely by the staff working at the surgery (doctors and office staff).

i. Explain two examples of physical security control for protecting this database.

[4

Marks]

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ii. Describe two ways of preventing the office staff from viewing sensitive medical data about patients that should be viewed only by doctors. **[4]**

Marks]

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