

**PAN AFRICA CHRISTIAN UNIVERSITY
EXAMINATIONS PAPER**



PAN AFRICA CHRISTIAN UNIVERSITY

BACHELOR OF BUSINESS INFORMATION TECHNOLOGY

END OF SEMESTER EXAMINATION

DEPARTMENT: COMPUTING AND INFORMATION TECHNOLOGY

COURSE CODE: BIT 106

COURSE TITLE: DATABASE SYSTEMS

EXAM DATE: AUGUST, 2020

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.
- None programmable calculator permitted
- Calculators on phones, tablets and computers are NOT permitted in Theory Papers

SECTION A

(Answer ALL questions in this section)

Question One

a) Consider the following SQL data definition for maintaining information about employees at a hypothetical company.

CREATE TABLE emp

```
( num          INTEGER NOT NULL,
  name         VARCHAR(20) NOT NULL,
  dept         VARCHAR(20) NOT NULL,
  salary       INTEGER NOT NULL,
  boss         INTEGER NOT NULL,
  PRIMARY KEY (num),
  FOREIGN KEY (boss) REFERENCES emp (num) );
```

You can assume that there is one president that has herself/himself as the boss, that all other employees have a boss that is someone else and that there are no cycles in the boss hierarchy for anyone other than the president. (A cycle would exist if, for example, Fred was the boss of Mary and Mary was in turn the boss of Fred.)

- a) Translate each of the following queries on this schema to SQL. In each case, also indicate if the query can be expressed in the relational algebra. **[5 Marks]**
- b) The number and name of each employee, excluding the president, together with the number and name of the employee's boss. The result should be sorted by the name of the boss and then by the name of the employee. **[2 Marks]**
- c) The names of the departments with the highest average salary of their employees. **[3 Marks]**

Section B (Answer Any Three (3) Questions)

Question Two:

- a) Citing relevant examples in each case, explain the strategies that organization and the top management can put in place to compete with other companies on database skills and take full advantage over the others in the Market. **[5 Marks]**
- b) In order to save costs, an Internet Service Provider (ISP) hosts both the website and the database of a company on the same web server. Discuss the **TWO** disadvantage of this decision from a security point of view. **[5 Marks]**

Question Three

- a) Below is a sample taken from a library database created from data in un-normalised form. Discuss **TWO** problem of inserting data into this table. **[2 Marks]**

Borrower Name	Daniel McBride
Borrower Address	11 Danforth Terrace
Borrower Phone No.	01632 961435
Book Title	A Long Way Home
Book Author	Elaine McAllister
Date Borrowed	21/07/07

- b) Draw an ER diagram with an entity set E that is over constrained, that is, for which it is not possible for E to have any entities. **[5 Marks]**

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yemploysanumberofstylistseachofwhomhasanumberofregularcustomers.D
etailsofappointmentsarekeptinadatabasecreatedfromdatainun-
normalisedform.Thesamplebelowshowsanentryinthedatabase.

Describe **THREE**

problemsthatwouldbeencounteredwhenmodifyingth
ecustomer'stelephonenumberinthedatabase. **[3 Marks]**

Stylist	Sharon
Appointment Date	23/06/06
Appointment Time	10.00
Customer Name	Pamela Forsyth
Customer Phone Number	01554 775643

Question Four:

- a) This question relates to concurrency control in the context of a multi-user online transaction processing environment. The following transaction runs in a highly concurrent database application (for example, sales order processing). UPDATE customer SET discount = discount+0.03 WHERE customerArea = 'Glasgow' COMMIT;
- (i) Translate each of the transaction on this schema to SQL and display sale order transaction details in a table form. **[3 Marks]**
- (ii) Assume the UPDATE fails to COMMIT and is unable to fully complete its execution. Explain the effect this might have on database integrity, assuming there were no concurrency control mechanisms **[4 Marks]**
- (iii) Describe one problem which may arise when a record is deleted from this database **[3 Marks]**

Question Five

- a) Consider the assertion: it is not possible to avoid the overhead of query optimization if one uses the dynamic embedded SQL standard. Is this true or false? Justify your answer. **[5 Marks]**
- b) Explain why it might be worthwhile to code SQL stored procedures when developing an application. For example, is there any incentive relating to performance?

[5 Marks]