

**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:             DICT 0133**

**COURSE TITLE:    DATABASE SYSTEMS**

**EXAM DATE:                DECEMBER, 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**

Your friend Bob just wrote a Java application that talks to a backend SQL Server DBMS. The application enables students to register for courses. Looking through the code, you notice that Bob's application performs the following sequence of operations.

a Prompt the user for a student ID and password. Start a new transaction. Look up the student in the database. If the student ID is not in the database or the password is incorrect, abort the transaction. Look up the courses recommended for the student. Display the courses on the screen. While the user does not choose QUIT Prompt the user to select a course. If the course is available, then register the student.

a) End while Commit the transaction. Explain the problem in Bob's design. Explain why this is a problem. **[5 Marks]**

b) Explain how to fix the problem. You do not need to write the updated application pseudo-code **[5 Marks]**

**SECTION B (Answer Any Three (3) Questions)**

**QUESTION TWO**

a) Using suitable example, describe **TWO** scenarios where a view can be helpful in a database management system. **[5 Marks]**

b) Explain why it is not always possible to perform SQL UPDATE/DELETE/INSERT statements on top of a view. **[5 Marks]**

**QUESTION THREE**

a) In order to scale a DBMS, one approach is to horizontally partition each relation across a set of machines in a cluster. Outline **TWO** is it expensive to execute transactions that touch arbitrary data in such a configuration. **[4 Marks]**

b) Company A recently bought company B. The two companies want to integrate their databases. Discuss **THREE** challenges that the integration will face. For each challenge give a concrete example. **[6 Marks]**

#### **QUESTION FOUR**

Jack is looking at customer data from two different branches of his store. Luckily, Jack made sure that the database in each branch followed the same schema. Each branch has a table CustomersBranch holding the ID, name, and state of each customer. He thus integrates the data by defining the following view:

```
CREATE VIEW CustomersData AS SELECT B1.name, B1. state FROM CustomersBranch1  
B1 UNION SELECT B2.name, B2. state FROM CustomersBranch2 B2
```

He now wants to analyze this data and he executes the following SQL query: `SELECT state, count(*) FROM CustomersData GROUP BY state`

But the results are different from what he expected: Both the number of groups and the counts of customers are much higher than what he expected.

- a) Give a possible explanation for each of these two problems. **[5 Marks]**
- b) Indicate one approach that the so-called "NoSQL" systems take to over-come the above challenge. **[5 Marks]**

#### **QUESTION FIVE**

Today, instead of purchasing physical machines, an alternate approach to running a database management system is to run it in the cloud. One of the key promises of the cloud is the illusion of infinite resources and the ability for users to elastically grow and shrink the resource consumption of their DBMS.

- a) State why it's difficult to scale a relational DBMS. **[6 Marks]**
- b) Describe one advantage and one disadvantage of map-reduce compared to parallel databases. **[4 Marks]**

### **QUESTION SIX**

An online picture sharing company uses a database with the following schema:

create table Usr (uid int primary key, uname text not null, city text not null);

create table Picture ( pid int primary key, uid int not null references Usr(uid), size int not null, pdf text);

Every user has a key (uid), a name (uname) and a city. Every picture has a key (pid), an author (uid) that is a foreign key to Usr, a size, and the pdf content (which is plain text).

Write an SQL database based from the schema from above including fields, values, update and how select data form various columns: **[10 Marks]**