Strathmore UNIVERSITY

FACULTY OF INFORMATION TECHNOLOGY
BACHELOR OF BUSINESS INFORMATION TECHNOLOGY
END OF SEMESTER EXAMINATION
BBT 3104 - Advanced database systems

DATE: 21st August 2019 Time: 2 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

QUESTION ONE *(30 marks)*

a) Describe, in detail, the activity that a DBA must perform in the following circumstances: *(12 marks)*
   i. To move from UNF to 1NF
   ii. To move from 1NF to 2NF
   iii. To move from 2NF to 3NF
   iv. To move from 3NF to BCNF
   v. To move from BCNF to 4NF
   vi. To move from 4NF to 5NF

b) SUPPOSE that a first-year student is working on a project to map units being taught to the lecturers who teach them as well as to the core reading materials for the unit based on the course outline. The main purpose of this system is to help students to know the most relevant reading materials for each unit when using the University library. The first-year student comes up with the following relation to store the data:

unit code	lecturer	core reading material

   i. Explain to the first-year student what a Multi-Valued Dependency is *(3 marks)*
   ii. Explain to the first-year student how the Multi-Valued Dependency has been formed in the proposed relation *(3 marks)*
   iii. Normalize the relation to the fourth normal form (4NF) and show how the database will look if the relation is in 4NF. *(5 marks)*

c) Use an appropriate database-related example to explain what a transaction does from the perspective of database theory *(3 marks)*
d) Explain why the design of a database is an iterative process *(4 marks)*

QUESTION TWO *(15 marks)*

a) Transform the following SQL query into its respective relational algebra expression

```
SELECT
   S.Name
FROM
   transcript T,
   Student S
WHERE
   T.Semester = 'F2004' AND S.Id = T.StudID
      AND S.Name = 'John Doe';
```

(3 marks)

b) Differentiate between structured, semi-structured, and unstructured data in today's enterprises and further state examples of where each can be applied in an enterprise *(12 marks)*

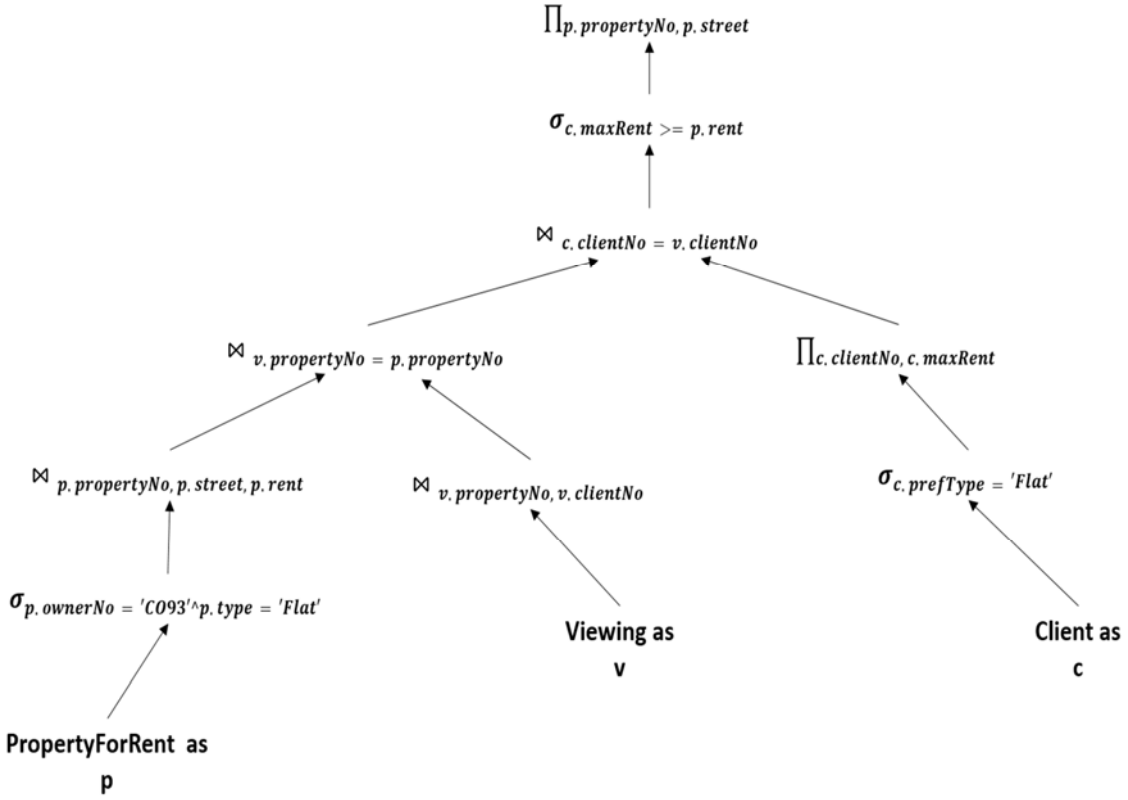
QUESTION THREE *(15 marks)*

a) Which of the following statements is/are true?
   a. A relation can still be in BCNF if it is not in 4NF
   b. A relation is in BCNF if every determinant of the relation is a candidate key
   c. BCNF more strict than 3NF
   d. A relation can still be in BCNF if it is not in 3NF
   e. None

(3 marks)

b) Explain what the term data wrangling means *(2 marks)*

c) Convert the following relational algebra tree into its equivalent SELECT statement *(10 marks)*



QUESTION FOUR *(15 marks)*

a) State THREE advantages of views and further provide code to create a sample view *(3 marks)*

b) Explain THREE reasons why databases are stored on mass storage as opposed to main memory *(6 marks)*

c) Describe the THREE components that constitute the total time it takes to access a sector that stores the data in a database. *(6 marks)*

QUESTION FIVE *(15 marks)*

a) Distinguish between the intension (schema) of a database and the extension (instance) of a database *(4 marks)*

b) List FOUR techniques that can be used to overcome performance bottlenecks in databases caused by disk I/O *(4 marks)*

c) Using relevant examples, explain FOUR concepts and operations associated with OLAP and data mining in business *(7 marks)*