CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

RESIT/SPECIAL EXAMINATION

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COSC 451: ADVANCED DATABASE SYSTEMS

STREAMS: BSC COMP SCI Y4S1   **TIME: 2 HOURS**

DAY/DATE: FRIDAY 05/11/2021   **8.30 A.M – 10.30 A.M.**

INSTRUCTIONS:

- Question number 1 is compulsory. Answer any two questions from the rest.

SECTION A (30 MARKS)

QUESTION 1

a) Define the following terms as applied in database systems: (4 Marks)

    i.   Relational algebra
    ii.   Schema
    iii. Query optimization
    iv. Query processing

b) State four reasons why query optimization is important.   (4 Marks)

c) Differentiate between database and data warehouse.   (4 Marks)

d) Distinguish between data security and data integrity.   (4 Marks)

e) Explain the following joins as applied in relational algebra: (6 Marks)

    i.   Equijoin

    ii.   Inner Join

    iii. Natural Join

f) Write the relational algebra version of the following SQL expression: (5 Marks)

Select regno, Surname Othernames From student Where DOB> 20/3/1988

g) Explain encapsulation, inheritance and polymorphism as in object databases. (3 marks)

Question 2

a) Differentiate between OLTP(online transaction processing) and data warehousing.(4 marks)
b) With the aid of a diagram, discuss the multi-dimensional data model of the data warehouse.

(6 Marks)

c) Consider the following tables:

Product (ProductNo, ItemName, Price)

Shop (shopID, location)

Stocked (ProductNo, shopID, amount)

And the following query: *SELECT Product.price ,Shop.Location FROM Product JOIN Stocked ON Stocked.productno = product.productno JOIN Shop ON Shop.shopID = Stocked.ShopID WHERE Product.ItemName = 'Navy Suit' AND Shop.location = 'London';* Draw the query tree that corresponds to the most efficient way of processing this query.

(10 marks)

Question 3
a) A data administrator intending to create a data warehouse needs to be alive to the problems of implementation. As an expert in database system advice the DA what challenges to expect along the way. (8marks)

b) Consider the following schema:

Suppliers (sid : integer, sname : string, address : string)
Parts (pid : integer, pname : string, color : string)
Catalog (sid : integer, pid : integer, cost : real)

    i.   The key fields are underlined and domain of each field is listed after the field name.

(2 Marks)

    ii.   Find the name of suppliers who supply some red parts. (2 Marks)

    iii.   Find the sids of suppliers who supply some red or green parts. (2 Marks)

    iv.   Find the sids of suppliers who supply some red part or are at 221 packer Ave.

(2 Marks)

v.   Find the sids of suppliers who supply some red part and some green part. (2 Marks)

vi.   Find the sids of suppliers who supply every part.   (2 Marks)

Question 4

a) Explain any two types of complex applications that prompt the use of object databases instead of relational databases.   (4 marks)

b) Describe TWO possible security controls for each of the following threats to database security:

    i.   Loss of confidentiality;

    ii.   Loss of integrity;

    iii. Loss of availability.   (6 marks)

c) Organizations using computer applications systems are constantly faced with the deliberate theft or criminal destruction of computerized data or services, the use of hardware, software or data for illegal activities, or the illegal use of computers. Discuss threats and risks of store data or data in transit and outline the strategies to self shield and mitigation efforts an organization may employ.   (10 marks)

Question 5

c) State and explain two characteristic of distributed database management system. (4 marks)

d) With the aid of diagram describe the query optimizer architecture.   (8 Marks)

e) With aid of an example differentiate between clustered index and non-clustered indexing.

     (4 Marks)

f) With the help of a diagram, discuss the process of moving data from various sources into the data warehouse.   (4 Marks)