TUNKU ABDUL RAHMAN UNIVERSITY OF MANAGEMENT AND TECHNOLOGY

FACULTY OF COMPUTING AND INFORMATION TECHNOLOGY

ACADEMIC YEAR 2023/2024

OCTOBER EXAMINATION

INFORMATION TECHNOLOGY BAIT3133
DATABASE ADMINISTRATION

THURSDAY, 12 OCTOBER 2023   TIME: 2.00 PM – 4.00 PM (2 HOURS)

BACHELOR OF INFORMATION SYSTEMS (HONOURS) IN ENTERPRISE INFORMATION SYSTEMS

Instructions to Candidates:

Answer **ALL** questions. All questions carry equal marks.

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The following scenario will be used for ALL questions.

CompanyA sells a variety of household items. The shop's customers include individuals and retailers. An item may be reordered if it is out of stock.

The tables listed below have been designed for the database:

Customer (CustomerID, CustName, Address, PostCode, City, State, Phone, Email)
Employee (EmployeeID, EmpName, Phone, Email)
Supplier (SupplierID, CompName, ContactPersonName, Address, Phone, Email)
Item (ItemID, ItemDescription, UnitCost, UnitPrice, QuantityOnHand, SupplierID*)
Sale (TransactionNo, CustomerID*, EmployeeID*, SaleDate, Total)
SaleItem (TransactionNo*, ItemID*, Quantity, SellingPrice)

Question 1

a)   CompanyA's director informed you that there are three groups of users:

sales personnel – deals with Customers and Sales only,
                can view Customer details,
                view, add, modify Sale data but cannot delete records
managers – Overall management of the system, full access to all tables, and only managers
            can delete records.
administrative personnel – general administration, deals with Employees, Items, Suppliers
                view, add, modify Employee, Item,
                view, update the QuantityOnHand of Supplier

Write the code to create the proper roles and give proper authorisations to these groups of users.   (15 marks)

b)   CompanyA adopts the following backup and recovery procedure:
A full image backup to tapes is performed every Friday evening after office hours. The tapes are shipped to a remote site on Thursday, the following week. Hardcopy of sales are kept for 5 years. For recovery procedure, the plan is to restore the database from the last full backup and reprocess all the sales records.

Discuss the effectiveness of the backup and recovery procedure described above. For any shortcomings, what alternative measures should CompanyA make to the procedure?
                                                                                (10 marks)

[Total: 25 marks]

This question paper consists of 4 questions on 4 printed pages.

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Question 2

a) RAID arrays are useful in supporting the availability of data in a DBMS. Which RAID level(s) would you propose for CompanyA and why? (10 marks)

b) **Authentication and Authorisation** should go hand-in-hand to improve database security at CompanyA. Explain why. (15 marks)

[Total: 25 marks]

Question 3

a) Assuming that 5,000 invoices are generated every week, what recommendation would you give to the designer about the use of derived attributes so to improve the performance of the query below?

```
SELECT SUM( Quantity * SellingPrice )
FROM Customer C
JOIN Sale S on C.CustomerID = S.CustomerID
JOIN SaleItem SI on S.TransactionNo = SI. TransactionNo
WHERE City = 'Setapak';
```

(10 marks)

b) Creating the correct indexes is one of the most important performance tuning techniques that a database administrator can perform. Consider the following query:

```
Select  CustName, C.City, C.State,
        I.ItemDescription, I.SupplierID,
        SI.Quantity, I.UnitCost
From    Customer C, Item I, SaleItem SI, Supplier SP, Sale S
Where   C.CustomerID    = S.CustomerID     AND
        S.TransactionNo = SI. TransactionNo AND
        SI.ItemID       = I.ItemID         AND
        SP.SupplierID   = I.SupplierID      AND
        S.SaleDate Between '15/02/2022' AND '14/06/2022' AND
        I.ItemDescription LIKE 'MOUSE%';
```

(i) What index(es) would you recommend for the query above? Explain your answer. (5 marks)

(ii) Rewrite the query to ensure that it uses the index created in Question 3 b) (i). (10 marks)

[Total: 25 marks]

This question paper consists of 4 questions on 4 printed pages.

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Question 4

a) A new DBMS product has been launched and the salesperson claimed that the need for locking is eliminated in their new product.

Discuss with relevant examples how the use of locking to provide concurrency can negatively impact database performance.   (10 marks)

b) You have recently received many complaints of an application that used to perform well but now is slow, after it has been in use for the last 6 months. You are considering rebuilding the tablespace and index.

Discuss THREE (3) main causes of performance degradation in the context of database and index disorganisation.   (15 marks)

[Total: 25 marks]