JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

DIPLOMA IN INFORMATION TECHNOLOGY

DIT 0407: DATABASE MANAGEMENT SYSTEM

ASSIGNMENT ONE

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1. To build a highly available distributed system, you must know what kinds of failures can occur.
    a. List possible types of failure in a distributed system.
    b. Which items in your list from part a are also applicable to a centralized system?
2. Consider a distributed system with two sites, A and B. Can site A distinguish among the following?
    a. B goes down.
    b. The link between A and B goes down.
    c. B is extremely overloaded and response time is 100 times longer than normal.
3. Explain the difference between data replication in a distributed system and the maintenance of a remote backup site.
4. Consider a relation that is fragmented horizontally by plant number:

    Employee (name, address, salary, plantNumber)

    Assume that each fragment has two replicas: one stored at the New York site and one stored locally at the plant site. Describe a good processing strategy for the following queries entered at the San Jose site.
    a. Find all employees at the Boca plant.
    b. Find the average salary of all employees.
    c. Find the highest-paid employee at each of the following sites: Toronto, Edmonton, Vancouver, Montreal.
    d. Find the lowest-paid employee in the company.
5. Explain why log records for transactions on the undo-list must be processed in reverse order, whereas redo is performed in a forward direction.
6. Explain the purpose of the checkpoint mechanism. How often should checkpoints be performed? How does the frequency of checkpoints affect:

a. System performance when no failure occurs?
b. The time it takes to recover from a system crash?
c. The time it takes to recover from a media (disk) failure?

7. Suppose the deferred modification technique is used in a database.
    a. Is the old-value part of an update log record required any more? Why or why not?
    b. If old values are not stored in update log records, transaction undo is clearly not feasible. How would the redo-phase of recovery have to be modified as a result?
    c. Deferred modification can be implemented by keeping updated data items in local memory of transactions, and reading data items that have not been updated directly from the database buffer. Suggest how to efficiently implement a data item read, ensuring that a transaction sees its own updates.
    d. What problem would arise with the above technique, if transactions perform a large number of updates?

INSTRUCTIONS:

i. The work should be typed and printed (Font: Times New Roman, Size 12).
ii. The references should be clearly stated.
iii. Start with a cover page containing your name, registration number, course code and course name and the purpose of the assignment. (cover page is not inclusive of the minimum 3 pages)
iv. ASSIGNMENT IS DUE 19th August 2021.