Indian Institute of Information Technology, Allahabad

End-Semester (May-2020)

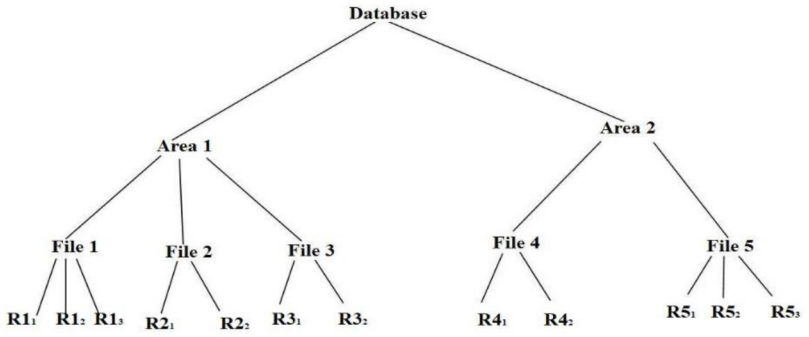
Paper: Mobile Data Management (IMDM840E/IMDM630E)

B. Tech (IT) Time: 2 Hrs.

Max. Marks- 75 **PS- Dr. Manish Kumar**

All the questions are compulsory.

1 Define the compatibility matrix for five modes [IS, IX, S, SIX, X] of locks. Consider the following database tree. Suppose a transaction T_1 wants to read $R3_1$and $T3$ wants to write to $R3_2$.Using multiple Granularity protocol, write the steps for acquiring locks for the execution of the operations by above transactions. **[10 Marks]**



2 Let us Assume, that 66 MHz of bandwidth is allocated to a particular frequency division duplexing cellular telephone system which uses two-50 KHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell if a system uses:

(a) 8-cell reuse
(b) 14-cell reuse
(c) 24-cell reuse

If 2 MHz of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell for each of the system. **[10 Marks]**

3 Consider **HICOMO** transaction model, the base database at the server is updated by source transaction. This requires installing updates of **HICOMO** transaction and must be converted to source transactions. There is a function of transaction transformation. Write down the steps of transaction transformation function. **[10 Marks]**

4 Consider a variant of the tree protocol called the forest protocol. The database is organized as a forest of rooted trees. Each transaction T must follow the following rules:

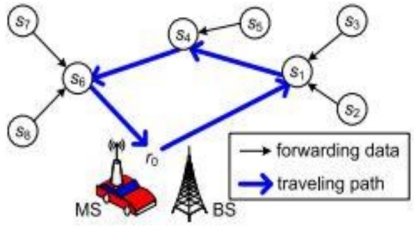
- The first lock in each tree may be on any data item.
- The second, and all subsequent, locks in a tree may be requested only if the parent of the requested node is currently locked.
- Data items may be unlocked at any time.
- A data item may not be relocked by T_i after it has been unlocked by T_i.

Show that the forest protocol does not ensure serializability. **[5 Marks]**

5 An emergency patient dispatch query can be stated as follows: *Find the right hospital or take the patient to the default hospital, then dispatch patient status to the emergency doctor for getting the correct treatment.* Considering the ***Moflex*** transaction model, illustrate how the transaction fits into ***Moflex*** transaction Structure. **[10 Marks]**

6 **(a)** How to schedule a Short traveling path for the mobile sink to get data from sensors while sensors have: (i) same sensing rates, (ii) Different sensing rate. **[5 Marks]**

(b) Discuss the following situations:
(i) how to decide the round time T for mobile sink for data collection?
(ii) Effect of the number of sensors, field area, and buffer capacity on path planning for the mobile sink. **[5 Marks]**



7 Consider the following two transactions: **[10 Marks]**

T1: read(A);
read(B);
if A = 0 then B: = B + 1;
write(B).
T2: read(B);
read(A);
if B = 0 then A: = A + 1;
write(A).

Let the consistency requirement be A = 0 ∨ B = 0, with A = B = 0 the initial values.
a. Show that every serial execution involving these two transactions preserves the consistency of the database.
b. Show a concurrent execution of T1 and T2 that produces a non-serializable schedule.
c. Is there a concurrent execution of T1 and T2 that produces a serializable schedule?

8 **(a)** An execution fragment, e_1, satisfy a Location Dependent Commit *iff* the fragment operations terminate with a commit operation and a location to data mapping exists". Discuss. **[5 Marks]**

(b) In the presence of processor mobility, data and transactions acquire exclusive properties. Identify and explain these properties. How do they affect database query processing? **[5 Marks]**