FILE ORGANIZATION AND DATABASE SYSTEMS: Class Test III

Instructions: 1. **Total Marks: 25 Duration 1 Hour (12 Noon – 1 P.M.)**
2. Date: **15-04-2021**
3. **Write your Roll Number, Name and upload pdf file in Microsoft Team**

1. Consider the following schedule for three transactions T_1, T_2 and T_3:

T_1	T_2	T_3
Read (A)		
	Read (B)	
		Read (C)
		Read (D)
	Write (B)	
		Write(C)
Read (C)		
	Read (C)	
Read (B)		
Write (C)		
Write (A)		
Write (B)		
	Write (C)	
		Write (D)

(i) Design the precedence graph and discuss regarding serializability of the schedule.
(ii) Design an equivalent schedule involving T_1, T_2 and T_3 which is serializable.
(iii)Assume the time stamp order of transactions T_1, T_2 and T_3 as: $TS(T_1)<TS(T_2)<TS(T_3)$. Whether the original schedule is possible to execute under the time stamp ordering protocol? Justify your answer.

(6M)

2.

a) With reference to query optimization, are the following equivalence rules hold? If yes justify your answer, otherwise give counter example.
(i) $\sigma_{\theta 1 \wedge \theta 2}(E_1 \bowtie_{\theta 3} E2) = \sigma_{\theta 1}(E_1 \bowtie_{\theta 3} (\sigma_{\theta 2}(E_2)))$, where $\theta 2$ involves only attributes from $E2$.
(ii) $\Pi_1(R\text{-}S) = \Pi_1(R) - \Pi_1(S)$ where both R and S are relation with two attributes only.

b) Consider the schema:
Emp(name,age,sal,d-no);Dept(d-no,name,d-name,location,mgr, ano);
Acct(ano, type, balance, bno) and *Bank(bno, bname, address).*
Optimize the following relational algebra expression using equivalence rules and draw the query tree. Show all the intermediate steps.

$\Pi_{Emp.name}(\sigma_{Dept.name='Math'\&balance>10000}((Emp \bowtie Dept) \bowtie Acct))$

(6M)

Contd..

3. Differentiate between a homogeneous distributed database system and a heterogeneous distributed database system. Explain the transparency features of a distributed database system. Discuss the utility of fragmentation in design and query processing of distributed databases. Why data replication is useful?
(7M)

4. With reference to database recovery, what is meant by forward and backward recovery? Explain with example. What can be done to recover modifications made by partially completed transactions that are running at the time of system crash?
(4M)

5. Consider the following schedule:

T1	T2
Read(A)	
	Write(B)
Read(B)	

Is this schedule possible under two-phase locking protocol? If yes, add lock and unlock instructions.
(2M)

****