Instructions: 1. **Total Marks: 25   Duration 1 Hour (11 AM – 12 .10 PM)**
2. Date: **12-04-2022**
3. **Write your Roll Number, Name and upload pdf file in Microsoft Team**

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

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

   a) Draw the precedence graph for this schedule.
   b) Write down all instances where one transaction "reads from" another transaction. (If T_2 reads from T_1, write $T_1 \rightarrow T_2$)
   c) Is this schedule conflict serializable? Why or why not? If it is conflict serializable, give the equivalent serializable schedule.
   d) If a set of transactions follows two phase locking protocol, does it ensures that deadlock situation will not occur? Justify your answer with proper example.

   (2M+1M+2M+1M)

2.

   a) Consider the relation *INSTRUCTOR(ID, name, dept_name, salary), TEACHES(ID, course_id, sec_id, semester, year), COURSE(course_id, title, dept_name, credits).* Draw the initial operator graph for the queries and apply heuristic rules to transform the queries into a more efficient form. Show all the intermediate steps.

   i. $\Pi_{name,title}\left(\sigma_{dept\_name="Music" \wedge year=2009}\left(INSTRUCTOR \bowtie \left(TEACHES \bowtie \Pi_{course\_id,title}(COURSE)\right)\right)\right)$

   ii. $\Pi_{name,title}\left(\sigma_{dept\_name="Music"}(INSTRUCTOR \bowtie TEACHES) \bowtie \Pi_{course\_id,title}(COURSE)\right)$

b) Discuss the advantages and disadvantages of transferring data bucket wise instead of block wise for sequential and random processing of data.

(4M+2M)

3. Discuss the potential advantages of distributed databases. Discuss different kinds of data fragmentation and the utility of fragmentation in the design and query processing of distributed database. Why data replication is useful in Distributed Databases Management System?

(4M)

4. Discuss the essential features of a heap file organization. For what type of operations heap file is most suitable? Justify your answer.
If a file uses hashed file organization, is it possible to perform range queries on a search key value? If yes, justify your answer.

(3M+2M)

5. In the process of recovery from a system failure, discuss the importance and structure of log table. Write short note on (i) transaction -consistent check point, (ii) transaction- oriented check point and (iii) write-ahead log strategy.

(4M)

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