

[This question paper contains 4 printed pages.]

3129

Your Roll No.

MECTA

J

COMPUTER TECHNOLOGY AND APPLICATION

Paper – CS.507

(Data Base Systems)

Time : 3 hours

Maximum Marks : 100

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Attempt any five questions.

Assume missing data, if any.

1. (a) What is the difference between persistent and transient objects? How is persistence handled in typical object oriented data base systems? (6)
- (b) What is the need for mobile databases? How transaction processing is done in these databases? (7)
- (c) What do you understand by multimedia databases? How information retrieval is done in these databases? (7)
2. A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate in each game. It is desired to keep track of the players

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participating in each game for each team, the positions they played in that game, and the result of the game.

- (a) Design an ER schema diagram for this application, stating any assumptions you make.
- (b) Convert this ER to relational schema.
- (c) Check in which normalization form it is.
- (d) Is there a weak entity type? If so, give its name, partial key and identifying relationship.

(10+4+3+3=20)

3. (a) What is union compatibility? Why do the UNION, INTERSECTION and DIFFERENCE operations require that the relations on which they are applied be union compatible? (3)

- (b) Discuss the meaning of the existential quantifier (\exists) and the universal quantifier (\forall). (2)

- (c) Show how you may specify the following relational algebra operations in tuple relational calculus.

- (i) $R(A, B, C) * S(C, D, E)$

- (ii) $R(A, B, C) - S(A, B, C)$

- (iii) $R(A, B) \div S(A)$

- (iv) $R(A, B, C) \cup S(A, B, C)$

- (v) $\sigma_{A=C} (\pi_{A,B} (R(A, B, C)))$ (5×3=15)

4. (a) Write external merge sort algorithm for sorting. (8)

- (b) How many passes will be needed in the merge phase of the external sort algorithm to sort a file of 4096 blocks with an available buffer space of 64 blocks. (5)
- (c) Compare the cost of two different query plans for the following query :

$$\sigma_{\text{salary} > 40000} (\text{Employee} \bowtie_{\text{DNO} = \text{DNUMBER}} \text{DEPARTMENT})$$

Employee has 10000 rows stored in 2000 blocks and has columns S Sn, DNo, Salary. Department has 50 rows stored in 5 blocks, and his Columns DNUMBER and MGRSSN. (7)

5. (a) What do you mean by conflict serializability ? How do you test for conflict serializability of a schedule ? What is a serial schedule. (8)
- (b) Consider the three transaction T_1 , T_2 and T_3 , and the schedules S_1 and S_2 given below.

Draw the serializability (precedence) graphs for S_1 and S_2 and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s).

$T_1 : r_1(X); r_1(Z); w_1(X)$

$T_2 : r_2(Z), r_2(Y), w_2(Z), w_2(Y)$

$T_3 : r_3(X), r_3(Y), w_3(Y)$

$$S_1 : r_1(X), r_2(Z), r_1(Z), r_3(X), r_3(Y) \\ w_1(X), w_3(Y), r_2(Y), w_2(Z), w_2(Y)$$

$$S_2 : r_1(X), r_2(Z), r_3(X), r_1(Z), r_2(Y) \\ r_3(Y), w_1(X), w_2(Z), w_3(Y), w_2(Y) \quad (8)$$

- (c) What do you mean by fragmentation and transparency in distributed databases? (4)
6. (a) What is two phase locking protocol? How does it guarantee serializability? (5)
- (b) What is a timestamp? How does system generate timestamps? Discuss timestamp ordering protocol for concurrency control. (7)
- (c) Describe various partitioning strategies for parallel databases. (8)
7. Write short notes on any **four** of the following:
- (a) Cost of Hash Join
- (b) Block nested loop Join
- (c) Equivalence rules for transformation of relational expressions
- (d) Spatial databases
- (e) Real time databases
- (f) Hierarchical databases
- (g) Object oriented relational databases (5×4=20)