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MANIPAL INSTITUTE OF TECHNOLOGY
(Constituent Institute of Manipal University)
MANIPAL-576104

SIXTH SEMESTER B.E (CSE) DEGRE MAKE-UP EXAMINATION
MAY/JUNE 2012
Advanced Database Systems (CSE 310.2)
(REVISED CREDIT SYSTEM)
19-07-2012

TIME: 3 HOURS   MAX.MARKS: 50

Instruction to Candidates
- Answer **any five** full questions

1	a)	With an example, explain nested-loop join and hash join algorithms used in computing the join of relations.
	b)	Consider the following SQL query of Bank database 　　Select branch_name,avg_balance 　　　from (select branch_name,avg(balance) 　　　　　from account 　　　　　group by branch_name) 　　　as branch_avg(branch_name.avg_balance) 　　where avg_balance>1200; Write an efficient relational algebra expression that is equivalent to this query. Justify your choice.
	c)	Suppose that a B+-tree index on *branch-city* is available on relation *branch*, and that no other index is available. List different ways to handle the following selections that involve negation? 　i)　$\sigma \neg$ (branch-city<"Brooklyn")(branch) 　ii)　$\sigma \neg$ (branch-city<"Brooklyn" $\vee$ assets<5000)(branch)　　　　　　　　(4 + 4 + 2)
2	a)	Consider the relations $r1(A,B,C)$, $r2(C,D,E)$, and $r3(E,F)$ and assume that there are no primary keys, except the entire schema. Let $V(C, r1)$ be 900, $V(C, r2)$ be 1100, $V(E, r2)$ be 50, and $V(E, r3)$ be 100. Assume that $r1$ has 1000 tuples, $r2$ has 1500 tuples, and $r3$ has 750 tuples. Estimate the size of $r1 \bowtie 1\ r2 \bowtie r3$, and give an efficient strategy for computing the join.
	b)	Explain how to use a histogram to estimate the size of a selection of the form 　　1.　$\sigma_{A\leq v}(r)$ 　　2.　$\sigma_{A=v}(r)$
	c)	Explain i) the transaction properties and ii) the transaction with the help of state diagram. 　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(4 + 3 + 3)
3	a)	Show by example that there are schedules possible under the tree protocol that is not possible under the two-phase locking protocol, and vice versa.
	b)	State and Justify Thomas Write rule.

	c)	What is recoverable schedule? Why is recoverability of schedules desirable? Are there any circumstances under which it would be desirable to allow non-recoverable schedules? Explain your answer. (3 + 3 + 4)
4	a)	Explain the various Multiversion Schemes with example.
	b)	Explain the purpose of the checkpoint mechanism. How often should checkpoints be performed? How does the frequency of checkpoints affect: i) System performance when no failure occurs? ii) The time it takes to recover from a system crash? iii) The time it takes to recover from a media (disk) failure?
	c)	List the strengths of various kinds of database systems. (4 + 4 + 2)

5	a)	A car-rental company maintains a database for all vehicles in its current fleet. For all vehicles, it includes the vehicle identification number, license number, manufacturer, model, date of purchase, and color. Special data are included for certain types of vehicles:
		 Trucks: cargo capacity.
		 Sports cars: horsepower, renter age requirement.
		 Vans: number of passengers.
		 Off-road vehicles: ground clearance, drivetrain.
		 i) Construct an SQL schema definition for this database. Use inheritance
		    where appropriate.
		 ii) Find the vehicle identification number of sports car with highest horsepower
		    and no renter age requirement.
		 iii)Find the manufacturers of the Trucks with higher cargo capacity than the average of all the
		    Trucks.

	b)	List and Explain the features of object persistence in Java programs. ((2+2+2) + 4)
6	a)	Consider a relation that is fragmented horizontally by *plant number*: *employee* (*name, address, salary, plant number*) 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 second highest paid employee in the company.
	b)	Explain the coordinator selection algorithm with example. Discuss this algorithm with centralized coordinator system. ((1+1+2+2) + 4)