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Total number of printed pages – 3

B. Tech
BECS 2208

Third Semester Examination – 2013

DATABASE MANAGEMENT SYSTEM

BRANCH : MECH

QUESTION CODE : C-482

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which are compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
- (a) What is data independence ?
- (b) What do you mean by atomicity in DBMS ?
- (c) Define foreign key. What is this concept used for ?
- (d) What is meant by specialization and generalization ?
- (e) What is a weak entity set ? How is it represented in an E-R diagram ?
- (f) What is integrity constraint ?
- (g) What do you mean by a view ? How does it differ from a table ?
- (h) What is a canonical cover ?
- (i) What is phantom phenomenon ?
- (j) What is the difference between shared lock and exclusive lock ?
2. (a) Explain and differentiate between the two tier and three tier architectures for DBMS with suitable diagram. 5
- (b) Draw an E-R diagram for the company database. The entity sets for the company would be 5
- (i) Employee
- (ii) Department
- (iii) Project
- (iv) Dependents etc.

P.T.O.

3. Consider the following relational database schema : 2.5×4
- EMP(empno, empname)
 ASSIGNED_TO(empno, projectno)
 PROJECT(projectno, projectname, manager)
- Specify the following queries in relational algebra :
- (a) Retrieve all employee number and name of those who work on both project number CS353 and CS354.
 - (b) Retrieve the employee number and name of those who work on project whose projectname is "DATABASE"
 - (c) Retrieve the employee number of those who work on at least one of the projects where employee number 107 works on.
 - (d) Retrieve the employee number of those employees who work on all projects.
4. (a) Explain with example the different aggregate functions in SQL. 5
- (b) Consider the following 2 sets of functional dependencies : 5
- $F = \{ A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H \}$
- $G = \{ A \rightarrow CD, E \rightarrow AH \}$
- Check whether F covers G and G covers F.
5. (a) What is Armstrong Axiom ? Use Armstrong Axioms to prove the soundness of decomposition rule and pseudo transitivity rule. 5
- (b) Consider the universal relation $R = \{ A, B, C, D, E, F, G, H, I, J \}$ and the set of functional dependencies $f = \{ AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ \}$. What is the key of R ? Decompose R into 2NF and then 3NF relations. 5
6. (a) Consider the relations $r_1(A, B, C)$, $r_2(C, D, E)$ and $r_3(E, F)$ with primary keys A, C and E respectively. Assume that r_1 has 1000 tuples, r_2 has 1500 tuples and r_3 has 750 tuples. Estimate the size of $r_1 \bowtie r_2 \bowtie r_3$, and give an efficient strategy for computing the join. 5
- (b) What is meant by the term heuristic optimization ? Discuss the main heuristics that are applied during query optimization. 5

7. (a) Consider the following 2 transitions :

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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)

Add Lock and Unlock instructions appropriately in transactions T1 and T2, so that they observe the 2 phase locking protocol. Can the execution of these transactions result in a deadlock?

(b) Discuss the different types of transaction failures. What is meant by catastrophic failure ?

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8. Explain the following terms in brief :

2.5×4

- (a) Network Data Model
- (b) Dependency Preserving Decomposition
- (c) Timestamp based scheduler
- (d) Shadow paging.