COMP – 5-5(RC)

T.E. (Comp.) (Semester – V) (RC) Examination, November/December 2012
DATABASE MANAGEMENT SYSTEMS

Duration : 3 Hours | Total Marks : 100

Instructions: 1) *Answer* ***any five*** *questions, selecting atleast* ***one*** *from* ***each*** *Module.*
2) ***Assume*** *necessary data,* ***wherever*** *required.*

MODULE – I

1. a) Design a database for a world wide package delivery company. The database must be able to keep track of customers who ship items and customers who receive items ; some customers may do both. Each package must be identifiable and trackable, so the database must be able to store the location of the package and its history of locations. Locations include trucks, planes, airports and warehouses. Design should include an ER diagram, set of relational schemas and the list of constraints including primary and foreign key constraints. **10**

   b) What is a participation role in an ER diagram ? When is it necessary to use role names in the description of entity types ? Provide example. **5**

   c) What is a query language ? What is the difference between procedural and non procedural query language ? Is SQL a procedural or non-procedural language ? **5**

2. a) Explain with the help of an example distinction between the total and partial constraints. **4**

   b) What is the role of DBA in the DBMS system ? **4**

   c) Explain the distinction between condition defined and user defined constraints. Which of these constraints can the system check automatically ? Explain your answer. **6**

   d) Design a generalization-specialization hierarchy for a motor vehicle sales company. The company sells motorcycles, passenger cars, vans and buses. Justify your placement of attributes at each level of the hierarchy. Explain why they should not be placed at a higher or lower level. **6**

P.T.O.

MODULE – II

3. Consider the employee database given below :

employee (ename, street, city)

works (*ename*, cname, salary)

company (cname, city)

manages (ename, mgr_name)

a) Give an expression in SQL for the following queries : 12

i) Give an SQL DDL definition for this database, including the primary and foreign key constraints.

ii) Find the names and cities of all employees who do not work for the company "Projen".

iii) Find all employees in the company who earn more than each employee of "Projen".

iv) Assume that the companies may be located in several cities. Find all companies who are located in the same city as their managers.

v) Find companies whose employees earn a higher salary, on average, than the average salary at first bank corporation.

vi) Create a view containing the name of the company, the city in which it is located, the name of the manager, maximum and minimum salary offered by the company.

b) Give an expression in relational algebra for the following queries : 6

i) Find the names, street addresses and cities of all employees who work for the company "Projen" and earn more than Rs. 25,000.

ii) Find employee with the maximum salary.

iii) Get a list of employees earning a salary higher than their managers.

c) Answer the following query in the TRC. 2

Find the names, street addresses and cities of all employees who work for the company "HCL" and earn more than Rs. 50,000.

4. a) For a set F of FD's for relation R {A, B, C, D, E, F} :-
   i) F = {AB → C, C → A, BC → D, ACD → B, BE → C, CE → FA, CF → BD, D → EF}, find a canonical cover. Also find the keys of R. 7
   ii) Suppose owner of relation R is user 1. Provide SQL commands for the following :
      A) User 1 wants to grant the select privileges to R to user 2 with a power to pass on this privilege to other users. 1
      B) User 1 wants to grant the update privilege on the A and D attributes of the relation R to user 3. 2
      C) User 1 wants to go for a holiday. So he wants user 4 to handle all his tasks once he leaves. What are the privileges he grants to user 4 and what commands to execute once he is back from his holidays ? 3
   b) What is the difference between the primary key, candidate key and the super key ? Give example. 5
   c) Define the term functional dependency. Explain it with the help of an example. 2

MODULE – III

5. a) What type of constraints are inclusion dependencies meant to represent ? Explain using an example. 4
   b) Consider the relation for the published books. 8

   BOOK (book_title, authorname, book_type, list price, author_affil, publisher)

   Author_affil refers to the affiliation of author

   Suppose the following dependencies exist

   book_title → Publisher, book_type

   book_type → list price

   Authorname → author-affil

   i) What normal form is the relation in ? Explain your answer.
   ii) Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition.
   c) Consider the following schema : 8

   Customer (cid, cname,ccity) ; Deposit (cid,accno) ; Account (accno, branch_city, balance)

   Consider the query to find the names of all the employees having an account in the same city (branch_city) in which they leave and have balance over Rs. 50,000. Draw the query graph and the initial query tree for the above query and then show how the query can be translated to the optimized query. Under what circumstances would you use each of the query trees ?

6. a) What do you mean by external sorting ? Explain the sort-merge join algorithm. A file of 4096 blocks is to be sorted with an available buffer space of 64 blocks. How many passes will be needed in the merge phase of the external sort-merge algorithm ? 8

   b) Consider the relation REFRIG (Model #, year, price, manuf_plant, color), which is abbreviated as REFRIG (M,Y,P,Mp,C) and the following set F of functional dependencies : F = {M $\rightarrow$ Mp, MY $\rightarrow$ P, Mp $\rightarrow$ C}. 10

      i) Find the candidate key for REFRIG.

      ii) Check whether REFRIG is in 3NF and in BCNF giving appropriate reasons. Provide BCNF decomposition.

      iii) Consider the decomposition of REFRIG into D = {RI (M,Y,P), R2 (M,Mp,C). Is this decomposition lossless ? Does it preserve all the dependencies ? Justify your answer.

   c) What is a Join Dependency ? 2

MODULE – IV

7. a) Bring out the differences between the basic two-phase locking, strict two-phase locking and rigorous two-phase locking using a appropriate example. 6

   b) Very briefly explain why the serialization order matches the commit order using rigorous two-phase locking. 6

   c) What is meant by the concurrent execution of database transactions in a multiuser system ? Discuss why concurrency control is required and provide example. 8

8. a) Which of the following schedule is conflict serializable ? For each serializable schedule, determine the equivalent serial schedule. Do the schedules also satisfy view serializability ? Also check whether the given schedule is recoverable and cascadeless. Add the commit points accordingly and give the resulting schedules for the recoverable and cascadeless schedules, ri(x)-represents read of data item x by transaction i ; wi(x) represents write on data item x by transaction i. 12

      i) r1(x) ; r2 (x) ; w1 (x) ; r2 (x) ; w3 (x) ;

      ii) r3 (x) ; r2 (x) ; r1 (x) ; w3 (x) ; w1 (x) ;

   b) What is the difference between constrained write and unconstrained write assumption ? Which one is more realistic ? 4

   c) What is serializability ? What are the uses of serializability ? 4