BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR
B.E. (IT) Part-III, 5ᵗʰ Semester Examination, 2011

Database Management System (IT-503)

Time : 3Hours   Full Marks: 70

Answer question no.1 and any FIVE from the rest

1.   Chose the appropriate answer.
   i) A functional dependency of the form X→Y is trivial if
       a)$Y \subseteq X$ b)$Y \subset X$ c) $X \subseteq Y$ d) $X \subset Y$ and $Y \subset X$
   ii) A top to bottom relationship among the items is established by a
    a) hierarchical schema   b) network schema
    c) relationship schema   d) all of these
   iii) We have the set of FDs, {B -> C, C -> A, B -> D}, for the relation schema R(A,B,C,D).
   Which of the following decompositions has the dependency preserving property?
           a)   a decomposition with relation schemas (C,A) and (C,B,D)
           b)   a decomposition with relation schemas (A,C,D) and (B,D)
           c)   a decomposition with relation schemas (C,A) and (A,B,D)
           d)   all of the above
   iv) If concurrent execution of transaction occurs then dirty read problem happens when
           a) One transaction updates a database item and this data is lost
           b) One transaction updates a database item and then transaction fails
           c) Aggregate function of one transaction calculate some values before they are updated
           d)The aggregate function of one transaction calculate some values and while other
           transaction are updating some of these values
   v) Which of the following is not likely to be found in a data dictionary?
           a) Names of fields   b) Frequency of back ups
           c) Programs to access the data   d) Security of the data
   vi) Every cascade less schedule is
           a) Non recoverable schedule   b) Recoverable schedule
           c) Both (a) and (b)   d) None of the above.
   vii) Generally for a weak entity set to be meaningful it must be a part of a
           a) one-to-one relationship   b) one-to-many relationship
           c) many-to-many relationship   d) none of the above
   viii) In an entity relationship, y is the dominant entity and x is a subordinate entity. Then which
   one is incorrect?
   a) Operationally, if y is deleted, so is x   b) x is existence dependent on y
   c) Operationally, if x is deleted, so is y   d) Operationally, if x is deleted, y
                                                    remains same

ix)   Chose the correct statement
       a) An alternate key is a candidate key, that is not a primary key
       b) An alternate key is a primary key, that is not a candidate key
       c) An alternate key is a candidate key, that is also a primary key
       d) None of these
x).   The concept of locking can be used to solve the problem of
       a) lost update   b) uncommitted dependency
       c) inconsistent data   d) deadlock

10 X 1

2. What is the difference between database schema and database state? Explain the
    function of DBA. What are the different types of database users? Compare logical
    and physical data independence.

2+3+3+4

3. Compare hierarchical and network data model. What is recursive relationship? Why role name
is required in recursive relationship? Why is subclass needed in data modeling?

5+4+3

4. Consider the following database.
        Employee (name, street, city)
        Works(name, company_name, salary)
        Company (company_name, city)
        Manages (name, manager_name)
Write the queries in relational algebra.
        a) Find the name of the companies with most employees.
        b) Find the name of employees who live in same city as their manager.
        c) Find the name of the companies whose employees average salary higher than the
        average salary of CTS company.

Write the queries in SQL.
        e) Find all employees who earn more than every employee of CTS company.
        d) Find all companies located in every city where CTS company is located.

7+5

5. Why Armstrong's axioms are said complete and sound? For relation R(ABCDE) and
    $F = \{AB \rightarrow CD, A \rightarrow B, BE \rightarrow DA, E \rightarrow D, C \rightarrow D\}$, compute a canonical cover for F.
    (show all intermediate steps).
    Consider the following relation and FDs:
    Book(title, auth_name, book_type, price, affln, publisher)
    title → publisher, book_type
    book_type → price
    auth_name → affln
    Apply normalization until the relation can not be decomposed any further. State the
    reason behind each decomposition.

3+4+5

6. Consider the following transactions:

T0 : read(A);	T1 : read(B);
read(B);	read(A);
if A=0 then B:=B+1;	if B=0 then A:=A+1;
write(B);	write (A);

Let the initial value of A=B=0 and consistency requirement is A=0 or B=0.
Show that every serial execution involving these two transactions preserves the
consistency of database. Is there a concurrent execution of T0 and T1 which produces
serializability of schedule. If yes show the schedule. Consider the following schedule:
r3(Y);r3(Z);r1(X);w1(X);w3(Y);w3(Z);r2(Z);r1(Y);w1(Y);r2(Y);w2(Y);r2(X);w2(X);
Is the schedule is serializable ? If yes, find all the possible serial schedule.
Give an example of a strict schedule that is not serializable.

5+4+3

7. Write down the Thomas's Write rule for timestamp ordering protocol. Discuss the different
types of transaction failures. What are the advantages and disadvantages of deferred update
recovery technique? What are the disadvantages of shadow paging?

2+4+4+2

8. Why the records in a file are variable length? Explain how insert and delete operation
in a file with sparse index is done. What is the advantage of B+ tree index over B tree
index? How does tuple relational calculus differ from domain relational calculus?

2+5+2+3

9. Compare block-oriented and sorted-merge join operation. Describe the steps involved
in Query Processing. Consider the following relations:
Suppliers(sid, sname, address)
Parts(pid, pname, color)
Catalog(sid, pid, cost)
        Write the relational algebraic form of the following query:
Find the sids of suppliers who supply some red part or are at 221 Packer Street.
Draw the initial query tree of the query and optimize the query using heuristic optimization
technique

3+4+5