

**BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR**  
**B.E. (IT) Part-III, 5<sup>th</sup> Semester Examination, 2012**

**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) 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.
  - ii) The information about data in a database is called \_\_\_\_\_
    - a) Meta data
    - b) Tera data
    - c) Hyper data
    - d) None
  - iii) Consider the three tuples in a legal instance of a relation  $R(A,B,C) : (1,2,3), (4,2,3), (5,3,3)$  which of the dependencies does not hold for R
    - a)  $A \rightarrow B$
    - b)  $BC \rightarrow A$
    - c)  $B \rightarrow C$
    - d) all of the above
  - iv) Which of the followings are types of unrepeatable read?
    - a)  $R_1(X); R_1(X); W_1(X)$
    - b)  $R_1(X); W_2(X); R_1(X)$
    - c)  $W_2(X); R_1(X); R_1(X)$
    - d)  $W_1(X); R_1(X); R_2(X)$
  - v) 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
  - vi) Consider the join of a relation R (m tuples) with a relation S (n tuples). The maximum and minimum sizes of the join respectively, are
    - a)  $m+n$  and 0
    - b)  $mn$  and 0
    - c)  $m+n$  and  $|m-n|$
    - d)  $mn$  and  $m+n$
  - vii) If one attribute is a determinant of a second, which in turn is a determinant of a third, then the relation cannot be:
    - a) well-structured.
    - b) in 1NF.
    - c) in 2NF.
    - d) in 3NF attributes
  - viii) Which of the following statements are true?
    - (i)  $R \bowtie_{\langle \text{condition} \rangle} S \equiv \sigma_{\langle \text{condition} \rangle}(R \times S)$
    - (ii)  $R \bowtie_{\langle \text{condition} \rangle} S \equiv \Pi_{\langle \text{condition} \rangle}(R \times S)$
    - (iii)  $R \bowtie_{\langle \text{condition} \rangle} S \equiv R * \rho_{\langle \text{list} \rangle} S$
    - a) only (i)
    - b) only (ii)
    - c) only (iii)
    - d) both (i) and (ii)
  - ix) Consider a relation R (A,B,C,D,E) with the following functional dependency:  
 $A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A.$   
the candidate key for is
    - a) A
    - b) B
    - c) AC
    - d) C.

x) Consider the following relational schema pertaining to a student database:

Student(rollno, name, coursename)

Enroll(rollno, courseno, coursename)

The primary keys are shown underlined. The number of tuples in the Student and Enroll tables are 240 and 16 respectively. What are the maximum and minimum number of tuples that can be present in (Student \* Enroll)? Here \* denotes natural join.

- a) 16, 16                      b) 240, 16                      c) 3840, 16                      d) 3840, 240

1X10

2.

What is DBMS? What is database state? Describe the advantages of DBMS over file processing with respect to redundancy and integrity. Consider a two dimensional array of size m X n that is used in C programming language. Using the array as an example, illustrate the difference between three levels of data abstraction and between scheme and instance.

2+1+4+5

3.

Compare hierarchical and network data model. Is it possible for an identifying relationship of a weak entity type having degree greater than two? Give example to illustrate the answer. What is participation constraints in ER diagram? Discuss the difference between specialization and generalization in ER diagram.

4+3+2+3

4.

Consider the following table.

Employee (eno, ename, dnum, desgno, sex, city, basic,joindt)

Designation (desgno, desg)

Dept (dnum, dname)

Dependent (eeno,depen\_name, sex,relation)

Write the queries in relational algebra.

- a) Find the name of the female employees with basic greater than the average basic of their respective department.  
b) Find the designation wise no. of employees who have joined in the year 2000 in each department.

Write the queries in SQL

- c) Find out the department wise total basic of male employees only for the departments for which such total is more than 45000.  
d) Retrieve the name of the managers order by department no who have more than 1 dependents.

Write the queries in tuple relational calculus.

- e) Retrieve the name of employees who have no dependents.

5+5+2

5.

Discuss the different informal measure of goodness for a relational schema. Consider the relation R (A,B,C,D,E) and two sets of FDs.

- a)  $A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow E$                       b)  $A \rightarrow BC, D \rightarrow E$

Are they equivalent? Describe multivalued dependency with an example.

5+4+3

6.

With a state transition diagram describe the different states of a transaction. Consider the following transaction:

T1:

read(X);

X=X+10;

write(X);

T2:

read(X);

For simultaneous execution which problem may happen and why? Why is a serializable schedule considered correct? What are the conditions that lead to the schedules being view equivalent?

5+3+2+2

7.

What are the disadvantages of two phase locking? Prove that wait-die and wound-wait techniques avoid deadlock. What are checkpoints and why are they important? What are the disadvantages of deferred update technique?

3+4+3+2

8.

Describes the different approaches of representing variable-length record. Compare dense and sparse and dense index. Consider a disk with block size 512 bytes. A block pointer is 6 bytes long and record size is 7 bytes long. A file has 30000 EMPLOYEE records of fixed size and length of each record is 100 bytes. If there is a secondary index then how many block access is required to search a record using the index?

5+4+3

9.

Describe the entity integrity and referential integrity constraints. Why do the UNION and INTERSECTION operations require that the relation on which they are applied be union compatibility? Consider the following relations.

Employee (eno, ename, dnum, sex, city, salary)

Dept (dnum, dname, mgrno)

Project (pno, pname, dnum)

Works\_on (eno, pno, hour)

Write the relational algebraic form of the following query:

Retrieve the name of all employees in department no.5 who work more than 10 hours on "product X" project. Draw the initial query tree of the query and optimize the query using heuristic optimization technique.

4+2+6

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