

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech/(EE-NEW)/SEM-6/EE-604B/2013**

**2013**

**DATABASE MANAGEMENT SYSTEM**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for the following :  $10 \times 1 = 10$

i) The entity integrity constraint states that

a) no primary key value can be null

b) a part of the key may be null

c) duplicate object values are allowed

d) none of these.

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- ii) In a relational data model, the columns of a table are called
- a) relation
  - b) tuple
  - c) attribute
  - d) degree.
- iii) Data manipulation language enables user to
- a) retrieval of information stored in the database
  - b) insertion of information into the database
  - c) deletion of information from the database
  - d) all of these.
- iv) Consider the schema  $R ( ABCD )$  and functional dependencies  $A \rightarrow B, C \rightarrow D$ . Then the decomposition of  $R$  into  $R1 ( AB )$  and  $R2 ( CD )$  is
- a) every tuple of  $R1$  has a distinct value for  $K$
  - b)  $K$  is a key for some other relation
  - c)  $K$  cannot have a null value for tuples in  $R1$
  - d)  $K$  is a primary key for  $R1$ .
- v) Lack of normalization can lead to which one of the following problems ?
- a) Lost updates
  - b) Insertion problems
  - c) Deadlock
  - d) None of these.

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- vi) A table can be logically connected to another table by defining a
- a) hyperlink
  - b) primary key
  - c) foreign key
  - d) common field.
- vii) For a  $B$ -tree of order  $N$  with  $n$  nodes is of height
- a)  $\log 2n$
  - b)  $\log_2 n$
  - c)  $2\log_2 n$
  - d)  $\log_2 n^2$
- viii) Serializability of concurrent transactions are ensured by
- a) locking
  - b) time stamping
  - c) both (a) and (b)
  - d) none of these.
- ix) Check-pointing is associated with
- a) log based recovery
  - b) non-log based recovery
  - c) both ( ) and (b)
  - d) none of these.
- x) Boyce-Codd Normal Form ( BCNF ) is in
- a) First normal form ( 1 NF )
  - b) Second normal form ( 2 NF )
  - c) Third normal form ( 3 NF )
  - d) Every determinant is a candidate key.

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**GROUP - B****( Short Answer Type Questions )**Answer any *three* of the following.  $3 \times 5 = 15$ 

2. a) Which operator is used to select some required attributes from a relation while discarding the other attributes ?
- b) i) Consider relation  $R = ( A, B, C, D )$  with the following :  
FDs :  $AB \rightarrow C, C \rightarrow D, \text{ and } D \rightarrow A$   
List all candidate keys of  $R$ .
- ii) Consider relations  $S = ( A, B, C, D )$  with the following :  
FDs :  $A \rightarrow B, B \rightarrow C, C \rightarrow D, \text{ and } D \rightarrow A$   
List all candidate keys of  $S$   $1 + 2 + 2$
3. a) Explain left outer join and right outer join with suitable example.
- b) Write a shot note on Aggregation with suitable example.  $2 + 3$
4. Discuss the ACID properties of transaction.
5. With suitable examples, show how recovery in a database system can be done using Log Files with
- a) Immediate updationg
- b) Deferred updation.  $2\frac{1}{2} + 2\frac{1}{2}$
6. a)  $R ( A, B, C, D ), F = \{ A \rightarrow B, A \rightarrow C, C \rightarrow D \}$   
 $R1 ( A, B, C ), \text{ and } R2 ( C, D )$ . Check the decomposition is lossy or lossless.
- b) What is view ? What is the usefulness of a view ?  
Write an SQL query to create view name blank with following attributes : ( accno, acname, balance )  $2 + 3$

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**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

- 7 a) i) Describe three-schema architecture of DBMS.
- ii) What is weak entity set ? Explain with suitable example.
- b) Write SQL statements on the following tables :
- SALESPEOPLE ( snum, sname, city commission )
- CUSTOMERS ( cnum, cname, city, rating, snum )
- ORDERS ( onum, amt, odate, cnum, snum )
- i) Show the commissions of all the sale persons who receive at least one order of amount greater than 5 000.
- ii) Find all the customers located in cities where sale person 'Amit' has customers.
- c) Define a foreign key. Why is the concept needed ?
- d) What is difference between JOIN and OUTERJOIN operation ?  $( 3 + 2 ) + \left( 2 \times 2\frac{1}{2} \right) + 2 + 3$

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8. a) Suppose we have given a schema  $R$  with attributes  $A, B, C, D$  and FDs  
 $F = \{ A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C, AC \rightarrow D \}$

Compute an irreducible set of FDs that is equivalent to this given set.

- b) Let the following relation schemas be given :

- Sailors( sid:integer, sname:string, rating:integer, age:real )
- Boats( bid:integer, bname:string, color:string )
- Reserves( sid:integer, bid:integer, day:date )

Perform the following queries on the tables in relational algebra, tuple relational calculus and domain relational calculus :

- i) Find the names of Sailors who have reserved boat 103
- ii) Find the names of Sailors who have reserved a Red boat.
- c) Describe strict two-phase locking protocol and also comment about the advantage(s) and disadvantage(s) ( if any ) of this protocol. 5 + 5 + 5

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9. a) Draw the *E - R* diagram of the following :

A General Hospital consists of a number of specialized wards ( such as Maternity, Paediatrics, Oncology, etc. ). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward.

- b) What do you mean by "Ternary relationship" ?

- c) Explain the difference between Primary key, Candidate key and Super key. 10 + 2 + 3

10. a) Consider insertion sequence :

8, 5, 1, 7, 3, 12, 9, 6, 20, 13. Construct B+ tree.

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b) Consider the following two transactions :

$T_1$  : read ( A ) ;

read ( B ) ;

if  $A = 0$ , then  $B := B + 1$  ;

write ( B )

$T_2$  : read ( B ) ;

read ( A ) ;

if  $B = 0$ , then  $A := A + 1$  ;

write ( A )

Add lock and unlock instructions to transactions  $T_1$  and  $T_2$  so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock ?

c) Explain conflict and view serializability with example.

5 + 5 + 5

11. a) Write a short note on B+ tree.

b) Describe in detail the various anomalies that can occur in various normal forms up to 3rd normal form.

c) State Armstrong's three axioms.

5 + 5 + 5

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