

B.Sc. (Hons.) Maths Group Semester-VI Examination 2017-18**Subject: Computer Science***Paper No: BCS-601 – Database Management Systems***Time: Three Hours****Full Marks: 70**

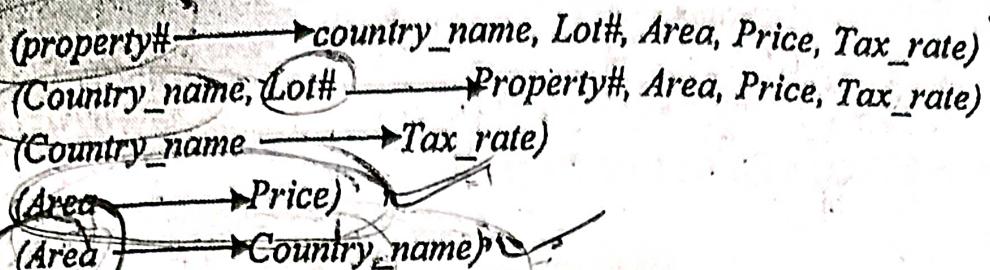
(Write your roll number at the top immediately on the receipt of this question paper)

Note: Answer five questions including question no. I, which is compulsory. The figures in the right hand margin indicate marks.

1. a) Define Relation and its cardinality? How Formal and Informal relation different?
Suppose relation Student (Name, SSN, Home_phone, Office_phone, Address, Age, GPA) contains record of hundred students then find the Arty, Degree and number of tuples in relation Student. [4]
 - b) Define Super key, Candidate key, Primary key and foreign key with suitable examples. How many maximum numbers of super keys can be formed from a relation having 'n' number of attributes? [3]
 - c) What is the difference between logical data independence and physical data independence? Which one is harder to achieve? Why? [3].
 - d) Define Transaction in a database and explain ACID properties of transaction with examples. [3]
 - e) Why Normalization of relation is needed? Explain it and define the lossless and dependency preserving Decomposition of relation R by taking suitable examples. [3]
 - f) Consider the relational Scheme R(ABCDE) and the functional dependencies FDs { A → B, C → D, A → E }. Is the decomposition of R into (ABC), (BCD), (CDE) Lossless? [3]
 - g) What is union compatibility? Why do the UNION, INTERSECTION, and DIFFERENCE operations require that the relations on which they are applied be union compatible? [3]
2. a) Define DBMS? How file oriented system is different from database oriented system? Write the advantages and drawbacks of database oriented system over file oriented systems. [7]
 - b) What are the different types of database end users? Discuss the main activities of each. [5]
3. a) Define Closure of an attributes? Give an efficient algorithm to compute the closure of X (where X is the set of attributes) under the set of functional dependencies F. Given the relation R(ABCDEH) with the set of functional dependencies
 $F = \{A \rightarrow CE, B \rightarrow D, C \rightarrow ADE, BD \rightarrow H\}$. Find the closure of X = BCD. [7]
 - b) Define Concurrency? Why concurrency control is needed? Explain in brief by taking suitable examples. [5]
4. Define 2NF, 3NF and BCNF? Consider the following relation with given set of functional dependencies [12]

Relation*LOTS(property#, country_name, Lot#, Area, price, Tax_rate)***Set of functional dependencies: F**

(2)



Find the candidate key and prime attributes of relation LOTS. Assume that given relation is in 1NF then find 2NF, 3NF and BCNF decomposition of relation LOTS.

5. Consider the relational schema given below:

[2x6=12]

Sailor(sailor#, sailor_name, age, rating)

Boats(boat#, boat_name, b_color)

Reserves(sailor#, boat#, day)

Primary key of each entity type are underlined. Write the following queries in Relational Algebra and SQL:

- a) Find the color of boats reserved by sailor name 'Ramesh'.
- b) Find the name of sailor who has reserves at least one boats.
- c) Find the details of a sailor who have not reserve any boats
- d) Find the details of sailors with age over 20 years who have not reserve a 'Red' and 'Green' Color boats.
- e) Find the name of sailor who have reserve all boats
- f) Find the color of boats reserved by sailor name 'Ramesh' or 'Rakesh'

6. a) Consider the following scenario

A University contains many Faculties. The Faculties in turn are divided into several Schools. Each School offers numerous programs and each program contains many courses. Lecturers can teach many different courses and even the same course numerous times. Courses can also be taught by many lecturers. A student is enrolled in only one program but a program can contain many students. Students can be enrolled in many courses at the same time and the courses have many students enrolled.

Design an ER schema for this scenario and make an ER diagram by taking appropriate assumptions to make the specification complete (like entity type, attributes and constraints etc.). Also convert this ER Diagram into relational tables. [8]

- b) What are the different kinds of attributes and how those are represented in an ER diagram? Explain by taking suitable examples. [4].

7. Write short notes on any Two of the followings

[6x2 =12]

- a) Extended Entity Relationship diagram
- b) Aggregate functions in Relational Algebra
- c) Database Models
- d) Query Processing Techniques

REFNO 011333

B.Sc. SEMESTER - V EXAMINATION 2018-19

Computer Science

Paper No. CS-203T: Database Management System (DBMS)

Max. Marks : 70

Time: Three hours

Note: Attempt any FIVE questions including question number one which is compulsory. The figures in right margin indicate the marks.

1. (a). Define the following terms with examples

Data, Information, Record, Database, DBMS, Database Systems

- (b). What do you understand by database replication? Why it is needed?

- (c). Consider the table

Employee(empno, fname, lname, dob, salary, dno)

Department(dnum, dname, mgrempnum)

Write the following SQL query in relational algebra, tuple and domain relational calculus

Select empno, fname, salary, dnum, dname

From Employee, Department

Where employee.dno = department.dnum AND employee.salary >= 5000

- (d). Differentiate between followings in SQL with examples

i) DROP, DELETE, and TRUNCATE command

ii) Where and HAVING clause

- (e). Differentiate between distributed database and client server database.

(f). What do you understand by redundancy and anomalies in a database? Discuss the different kind of anomalies present in a database by taking appropriate examples and how it can be eliminated.

(g). Define prime and non-prime attributes. Consider a relational schema R (A, B, C, D, E, G, H, I) with a set of functional dependency $F = \{A \rightarrow B, A \rightarrow C, BC \rightarrow D, D \rightarrow EG, G \rightarrow HI\}$, find the prime and non-prime attributes of R and also find candidate key, if any.

3.

2.

3.

4.

3.

3.

4.

contd.-2

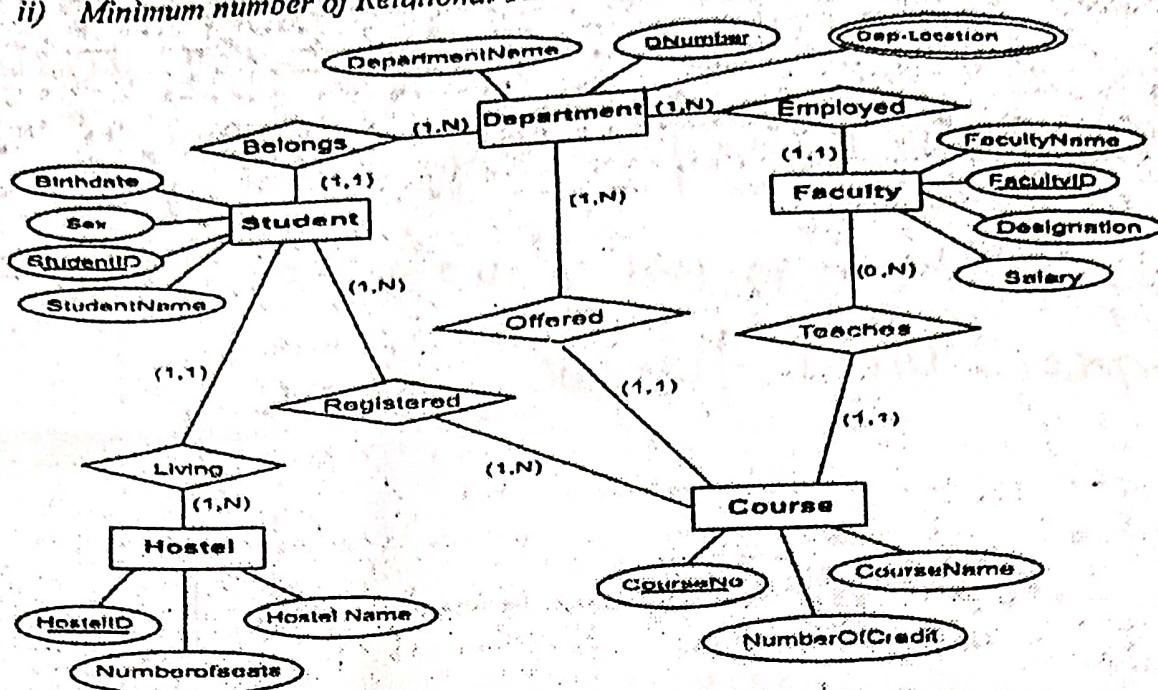
2. (a) Discuss the main characteristics of the database approach and how it differs from traditional file systems.

3

(b). Convert the ER diagram given below in to:

4

- ER diagram consisting of Participation constraints and cardinality ratio
- Minimum number of Relational Tables



3. Consider the following tables

Student(name, enrollno, DOB, Age, Sex, Address)

Enrolles(enrollno, dno)

Teacher(Tnum, Tname, TDOB, Tsex, Salary, Tgrade, dno)

Department(dnum, dname, dhodnum)

Where the primary key of each table is underlined and enrollno, dno is the foreign key in table Enrolles which reference the primary key of Student and Department table respectively, dno is the foreign key of table Teacher which references the primary key of table Department, and dhodnum is the foreign key of table Department references the primary key of table Teacher. Write the SQL DDL/DML statement for the following queries.

4

i) Write DDL statement for creating each table.

2

ii) Retrieve the dname, dhodnum and department HOD name of the entire department.

2

iii) Retrieve the information of all students who enrolled in more than one department.

2

iv) Retrieve the information of all those Teachers who is working in the department in which more than 10 teacher works.

2

v) Retrieve the department name, HOD name of those department in which more than 100 students enrolled.

4. Define Decomposition of relational Schema. Consider the Relational Schema R given below where X, Y, Z are the attributes of relational schema R:

X	Y	Z
S1	P1	T1
S1	P2	T2
S1	P3	T3
S1	P4	T4
S2	P1	T1
S2	P2	T2
S3	P2	T2
S4	P2	T2
S4	P4	T4

Perform the following operation in relational Algebra and compute the resultant table.

a) $R1 = \Pi_{x,y}(R)$ and $R2 = \Pi_{y,z}(R)$

b) $S = R1$ natural join $R2$

c) Is the decomposition $R1$ and $R2$ of R lossless or lossy

d) $P = \frac{R}{R1}$

e) $Q = \frac{\Pi_{x,y}(R)}{\Pi_y(R)}$

f) $U = \sigma_{z=T1 \vee T3}(R) \cup \sigma_{y=P1 \vee P2}(R)$

g) $U = \sigma_{z=T1 \vee T3}(R) - \sigma_{y=P1 \vee P2}(R)$

and

5.

- (a) Define functional dependency, closure of set of functional dependency and attribute closure. Consider the relational schema $R(A, B, C, D, E, G, H, I)$ with a set of functional dependency $F = \{A \rightarrow B, A \rightarrow C, C \rightarrow G, BC \rightarrow D, D \rightarrow EG, G \rightarrow HI, H \rightarrow AC\}$ exists. Find the followings

7

- Closure of attributes $X = BCD$
- The non-redundant cover of F
- Test whether functional dependency $(HI \rightarrow EG)$ is in closure of set of functional dependency F or not

- (b). Differentiate between followings by taking appropriate examples.

5

- Entity, Entity set and Entity type
- Entity integrity and Referential integrity constraints
- Unique key and Primary key constraints
- Simple vs. Composite attributes and Stored vs. Derived attributes

6.

- a). Define dependency preserving decomposition. Consider a relation schema $R(A, B, C)$ with set of functional dependency $F = \{A \rightarrow B, B \rightarrow C\}$. Answer the following questions

4

- When R is decomposed in to two sub relational schema $R1(A, B)$ and $R2(B, C)$ then find whether decomposition is lossy or lossless and justify your answer.
- When R is decomposed in to two sub relational schema $R1(A, B)$ and $R2(A, C)$ then find whether decomposition is lossy or lossless and justify your answer.

- b) Give the general definition of second normal form (2NF), third normal form (3NF) and Boyce-Codd normal form (BCNF). Given a Relational schema $R(A, B, C, D, E, H)$ with a set of functional dependency $F = \{A \rightarrow BCDEH, BC \rightarrow ADEH, D \rightarrow E, D \rightarrow B\}$ exists. What normal form is the relation in? Explain your answer. Determine the candidate keys of relational schema R and decompose this relation upto BCNF, if not already.

8

7.

- (a). Define transaction in a database and explain its properties. When and why concurrency control techniques are needed during the transaction in database systems.

4

- (b). Write the short notes on any two of the followings

2x4

- Query optimization
- Fragmentation in database
- Database Models
- Enhanced Entity Relationship (EER) Diagram

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B.Sc. (Hons.), Semester Vth Examination, 2013-14

Computer Science

Paper: CSR-601: Database Management System

[Time: Three hours]

[Full Marks: 70]

Note: Answer any five questions, including question number one which is compulsory. Terms and symbols used have their standard meaning.

1. Fill in the blanks :

(10)

- a. The number of attributes in a relation is called the of the relation.
- b. Immunity of the external schemas to changes in the internal schema is referred to as
- c. When one column of a table refers to the values in another column of the same table, it introduces a integrity constraint.
- d. The page table never changes during the execution of a transaction.
- e. Along with the GROUP BY clause, one can use the clause to define a condition on the group of tuples.
- f. and are two unary operations in relational algebra.
- g. 4NF is based on the concept of dependency.

- ii. A schedule S is not conflict serializable if the precedence graph contains.....
- i. and are the two desirable properties of relational schema decomposition.
- j. is an abstraction through which relationships are treated as higher level entities.

- a. Explain the difference between primary key and superkey. (3)
- b. What are multi-valued attributes, and how can they be handled within the database design? (4)
- c. What is meant by recursive relationship type? Give an example. (3)
- d. Define cardinality ratio. Draw an ER diagram to illustrate different cases of cardinality ratio. (5)

3.

- a. What is the loss-less join property of decomposition? Suppose that we decompose the schema $R=(A,B,C,D,E)$ into $R_1=(A,B,C)$ and $R_2=(A,D,E)$ check whether this decomposition is a lossy or lossless decomposition if the following set F of functional dependencies holds: $F=(A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A)$. (6)

P.T.O

- b. Define full, partial and transitive functional dependencies. Explain the normal form based on transitive functional dependency with suitable example. (6)

- c. Define Multi-valued functional dependency.

- 4.
- a. Discuss the immediate update technique of recovery. How it is different from deferred update technique? Why is it called the UNDO/REDO method? (6)
 - b. What is the two-phase locking protocol? What are some variations of the two-phase locking protocol? Why is strict two phase locking often preferred? (6)
 - c. What is a recoverable schedule? Why is recoverability of schedules desirable? (3)
- 5.
- a. With suitable example explain the difference between natural join, equi-join and Cartesian product operations. (5)
 - b. Consider the following relational database; answer each of the queries in SQL. (10)

Branch-scheme = (bname, bcity, assets)

Customer-scheme = (cname, street, ccity)

Depositor-scheme = (cname, account#)

Account-scheme = (bname, account#, balance)

1. Find account number of accounts with balances between Rs. 70,000 and Rs. 100,000.
2. Find all customers whose street includes the substring "main".
3. Find branches and their average balances where the average balance is more than Rs. 2000.

4. Delete the records of all accounts with balances below the average.
 5. Increase all balances by 10 percent. Whose balance is greater than average?
- 6.
- a. Describe the ANSI-SPARC three level architecture. How are these three levels related to the concept of physical and logical data independence? (6)
 - b. Describe the steps of query processing with a flow diagram. (3)
 - c. Explain any three Heuristic Rules for query optimization through examples. (6)
- 7.
- a. Define Weak Entity type. Explain how it is handled in relational database designing? (5)
 - b. Explain the Select and Project operators in Relational Algebra through an example. (4)
 - c. What are the database security issues? What is the difference between discretionary and mandatory access control? (6)