**B.TECH / CSE /5TH SEM/ CSEN 3102/2017**
**DATABASE MANAGEMENT SYSTEMS**
**(CSEN 3102)**

**Time Allotted : 3 hrs** **Full Marks : 70**

***Figures out of the right margin indicate full marks.***

***Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.***

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

**Group – A**
**(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) A functional dependency X→Y means that association from the domain of X to domain of Y is:
(a) many to many (b) one to many
(c) many to one (d) none of the above.

(ii) **Statement 1:** It is not always possible to normalize a relation to BCNF decomposition, preserving all functional dependencies and lossless join property.
**Statement 2:** It is always possible to normalize a relation to 3NF decomposition preserving all functional dependencies and lossless join property.
Considering the above two statements choose the right option from the followings:
(a) Only Statement 1 is correct.
(b) Only Statement 2 is correct
(c) Both Statement 1 and Statement 2 are correct
(d) Both Statement 1 and Statement 2 are incorrect.

(iii) **Statement 1:** If a schedule S1 is conflict serializable, then it implies that S1 will also be view serializable.
**Statement 2:** If a schedule S2 is view serializable, then it implies that S2 will also be conflict serializable.
Considering the above two statements choose the right option from the followings:
(a) Only Statement 1 is correct. (b)Only Statement 2 is correct
(c) Both Statement 1 and Statement 2 are correct
(d) Both Statement 1 and Statement 2 are incorrect.





(iv) _____is an abstraction through which relationships are treated as higher level entities.
(a) Generalization (b) Specialization
(c) Aggregation (d) Inheritance.

(v) Which of the following statement is true?
(a) Isolation property of a transaction can never be achieved under a concurrent execution schedule of transactions.
(b) Atomicity property of transaction can only be achieved under a serial execution schedule of transactions.
(c) Consistency property of a transaction can be achieved by controlling concurrency of a executing schedule of transactions.
(d) Durability property of a transaction can only be achieved by controlling concurrency executing schedule of transactions.

(vi) In a relation R, a multivalued dependency A→→B is called trivial if
(a) $A \cap B = \Phi$ (b) $B \cup A = R$
(c) either (a) or (b) (d) none of them.

(vii) A decomposition of R to R1 and R2 is lossless-join decomposition if
(a) common attributes between R1 and R2 forms a super key of either R1 or R2.
(b) common attributes between R1 and R2 forms a super key of both R1 and R2.
(c) common attributes between R1 and R2 forms a super key of R1, but not R2.
(d) common attributes between R1 and R2 forms a super key of R2 but not R1.

(viii) What are the desirable properties of a decomposition?
(a) Partition constraint (b) Dependency preservation
(c) Redundancy (d) Security.

(ix) If a schedule S can be transformed into a schedule S' by a series of swaps of non-conflicting database **read/write** instructions , then S and S' are always:
(a) Conflict Equivalent to each other
(b) View Equivalent to each other
(c) both (a) and (b)
(d) none of these.

(x) If A→B and _____ holds on a Relation R, then AC→D also holds on R.
(a) BC→D (b) AB→C (c) either (a) or (b) (d) none of these.

## Group - B

2. (a) Convert the ER – diagram shown in fig. 1 into a relational database (the primary keys are underlined):

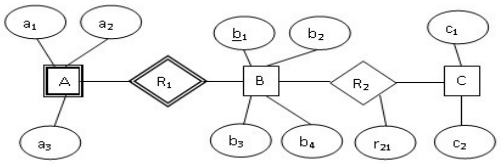


**fig.1**

(b) Differentiate with example between
(i) Single value and multiple valued attribute.
(ii) Candidate and super key.
(iii) Partial and primary key.

**6 + (3 × 2) = 12**

3. Write relational algebra expressions of the queries involving the following relations of a database of a engineering college :
STUDENT(rollno, name, courseId, enrolled_session); COURSE(courseId,courseName, Dept_Id), SUBJECT_PAPER(pcode, pname, courseId, semesterNo) ; MARKS_OBTAINED(rollno, pcode , marks, year_of_exam), DEPARTMENT(Dept_Id, Dname), Faculty(empid, name, sal, Dept_id), Subject_Taught(empid, pcode, session)
(a) Find the minimum salary of that department, whose average faculty salary is maximum among all other departments.
(b) Find the name and rollno of students, who have obtained highest marks in the subject CSEN1201, on the year 2016.
(c) Find the name of faculties who have not taught any subject of 8th semester during the session 2016.

**(3 × 4) = 12**

## Group - C

4. The set of Functional Dependencies F on a relation R(A,B,C,D,E) are given below : A→BC; EB→C; AB→C; A→B; AC→D; E→B;ABC→D; AB→E; EB→A
(i) Compute canonical cover, i.e., irreducible set of FDs equivalent to the given set F
(ii) Find all the candidate keys of this relation R.

**(6 + 6) = 12**





5. (a) Define Boyce Codd Normal form (BCNF)?
(b) Determine whether the following relations R1 and R2 are in BCNF, or not?
i) A relation R1(A, B, C) along-with FDs applicable to it are: AB→C; C→B.
ii) A relation R2(W, X, Y, Z) along-with FDs applicable to it are: XY→W; XZ→W; Y→Z; Z→Y.
Decompose the relations to BCNF, if possible, in a lossless manner by preserving all the functional dependencies.(Justify your answer for both the cases and also show the BCNF decomposition, in case it is possible.)

**2 + 5 + 5 = 12**

## Group – D

6. The tables in the database of a engineering college are as follows:
STUDENT(rollno, name, courseId, session);
COURSE(courseId,courseName, Dept_Id), SUBJECT_PAPER(pcode, pname, courseId, semesterNo) ; MARKS_OBTAINED(rollno, pcode , marks, year_of_exam), DEPARTMENT(Dept_Id, Dname), Faculty(empid, name, sal, Dept_id), Subject_Taught(empid,pcode,session)
Write the SQL statement for the following queries using the given tables:
(i) Find the name of the topper(s) of CSE 1st Semester of 2005 session. [Note: topper of a semester means one who obtained maximum aggregate marks considering all subjects of that semester]
(ii) Find the faculties who have taught maximum number of subjects in odd Semester of 2017 session and display their name along with number of subjects taught.
(iii) Display the name of the department that conducts course named "M.Tech in VLSI Design".
(iv) Display the lowest salary of each department along with department name, in the descending order of the department's lowest salary.

**(4 + 4 + 2 + 2) = 12**

7. Consider the relation Bank(Account_Id, Account_type, Amount, Cust_id, Cust_name,branch_name, city, head_Branch_name) and the set of functional dependencies:
F = {Account_Id→Account_type; Cust_id→Cust_name; Account_Id→ branch; Account_Id→ Amount; branch→ city; city→head_Branch}.
Decompose the relation Bank to 3rd Normal Form with respect to F. In detail, explain how each normal form is satisfied by each decomposed relation at each step of normalization.

**12**

## Group – E

8. (a) Consider two transactions T1 and T2 with following database operations:

$T_1$: $R_1(A)$ $W_1(A)$ $R_1(B)$ $W_1(B)$

$T_2$: $R_2(A)$ $W_2(A)$ $R_2(C)$ $W_2(C)$

where, $R_i(x)$ and $W_i(x)$ are read and write operations of $T_i$ on data item x respectively. **Find** out whether the following concurrent schedule S is conflict serializable or not - justify your answer.

S = $R_1(A)$ $W_1(A)$ $R_2(A)$ $W_2(A)$ $R_1(B)$ $W_1(B)$ $R_2(C)$ $W_2(C)$

(b) Describe two phase locking protocol? How does it guarantee conflict serializability?

**5 + (3 + 4) = 12**

9. Write short notes on (**any three)** of the following:

(i) Query Processing.
(ii) Disadvantages of file based systems.
(iii) Log based recovery.
(iv) B-tree.

**(3 × 4) = 12**