Course Code : CST 308 **ITSJ/RW – 17 / 1344**

Sixth Semester B. E. (Computer Science and Engineering) Examination

DATABASE MANAGEMENT SYSTEM

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry marks as indicated against them.

(2) Assume suitable data and illustrate answers with neat sketches wherever necessary.

1. (a) Consider the following database schema, where the primary keys are underlined. Construct an expression in SQL for each of the following queries :—
Employee(SS#, ename, Add, Salary, gender)
Dept (Dept_name, Dno, mgress#, mgrstart_date)
Dept_location (Dno, Dlocation)
Project (Pname, Pno, Plocation, Dno)
Works_on (SS#, Pno, hours)

(i) Retrieve average salary of all female employees. (1)

(ii) For each project, list the project name and total hours per week spent on that project (2)

(iii) Find all employees in dept no. 6 who work for more than 12 hours per week. (2) 5 (CO 1 , 3)

(b) Consider the following database schema, where the primary keys are underlined. Construct an expression in Relational Algebra for each of the following queries :—
Sailors (sid, sname, rating, age)
Boats (bid, bname, color)
Reserve (sid, bid, reserve–date)

(i) Find the names of sailors who have reserved boat 103. (1)

(ii) Find the colors of boats reserved by Lubber. (2)

(iii) Find the names of sailors who've reserved all boats (2)
5 (CO 1)

2. (a) Suppose you are given a relation $R = (A, B, C, D, E)$ with the following functional dependencies : $BD \rightarrow E$, $A \rightarrow C$
Prove that the decomposition into R1 (A , B , C) and R2 (D , E) is lossy.

(i) Show how spurious tuples result from this decomposition with respect to the table below :

A	B	C	D	E
1	2	3	4	5
1	8	3	4	4

(ii) Use lossless Join decomposition algorithm to prove that this decomposition is lossy. 5 (CO 2)

(b) Consider the relation scheme R(A , B , C) with FDs $AB \rightarrow C$, $C \rightarrow A$. Show that the scheme R is in 3NF, but not in BCNF. Justify your answer. Also determine the minimal keys of R. 5 (CO 2)

OR

(c) If $R = \{ A, B, C, D, E \}$ and the functional dependency are
$F = \{ AB \rightarrow CE$,
$E \rightarrow AB$,
$C \rightarrow D \}$

What is the highest normal form of this relation ? Explain your answer. 5 (CO 2)

3. (a) Differentiate between the following :—

(i) Static and Dynamic hashing,

(ii) Sparse and Dense index. 5 (CO 4)

(b) Construct a B+ tree for following sequence 1 , 3 , 5 , 6 , 7 , 8 , 9 , 12 for $n = 3$. 3 (CO 4)

(c) What do you mean by function – based indexing ? What additional purpose does it serve ? 2 (CO 4)

4. (a) Discuss the cost components for a cost function that is used to estimate query execution cost. Which cost components are used most often as the basis for cost functions ?. 5 (CO 4)

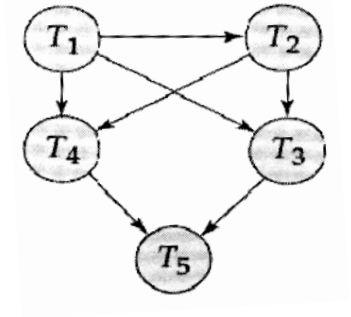
(b) Consider the following relation :
BRANCH (branch_name, branch_city, assets). Suppose that a B^+ tree index is available on branch_city, and no other index is available. Determine the best way to handle the following selections that involve negation.

(i) $\sigma \neg$ (branch_city < "Nagpur") (BRANCH)

(ii) $\sigma \neg$ (branch_city = "Nagpur") (BRANCH) 5 (CO 4)

5. (a) Consider the precedence graph of Figure 5 (a). Analyze whether the corresponding schedule is conflict serializable ? Explain your answer.

Fig 5(a)



5 (CO 5)

(b) Consider schedules S3, S4 and S5 below. Determine whether each schedule is strict, cascadeless, recoverable, or non recoverable. (Determine the strictest recoverability condition that each schedule satisfies.)
S3 : r1 (X) ; r2 (Z) ; r1 (Z) ; r3 (X) ; r3 (Y) ; w1 (X) ; c1 ; w3 (Y) ; c3 ; r2 ;
(Y) ; w2 (Z) ; w2 (Y) ; c2 ;
S4 : r1 (X) ; r2 (Z) ; r1 (Z) ; r3 (X) ; r3 (Y) ; w1 (X) ; w3 (Y) ; r2 (Y) ; w2 (Z) ;
w2 (Y) ; c1 ; c2 ; c3 ;
S5 : r1 (X) ; r2 (Z) ; r3 (X) ; r1 (Z) ; r2 (Y) ; r3 (Y) ; w1 (X) ; c1 ; w2 (Z) ; w3 (Y) ;
w2 (Y) ; c3 ; c2 ;

5 (CO 5)

OR

(c) Discuss the different measures of transaction equivalence. What is the difference between conflict equivalence and view equivalence ? 5 (CO 5)

6. (a) What is the system log used for ? What are the typical kinds of entries in a system log ? What are checkpoints, and why are they important ? What are transcation commit points, and why are they important ? 5 (CO 5)

(b) Compare the shadow – paging recovery scheme with the log – based recovery schemes in terms of ease of implementation and overhead cost. 3 (CO 5)

(c) Discuss the differnet types of transaction failures. What is meant by catastrophic failure ? 2 (CO 5)