

Registration No.:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages: 02

Course: IDD (B.Tech and M.Tech)

Sub\_Code: CSPC2004

4<sup>th</sup> Semester Regular Examination: 2024-25

SUBJECT: Database Engineering

BRANCH(S): CE, CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ELECTRICAL & C.E, IT

Time: 3 Hours

Max Marks: 100

Q.Code: S333

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- Which key is used to show the relationship between tables?
- What is schema?
- Define join.
- What is meant by specialization and generalization?
- What do you mean by canonical cover of a set of functional dependencies?
- Define transaction.
- What are different modes of Lock?
- What do you mean by multivalued attribute? Write the notation used for the same.
- List out anomalies of 1<sup>st</sup> Normal Form.
- What do you mean by cardinality ratio?

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- Draw and explain ER diagram that captures the information of the following schema.  
Employee(empno, name, office, age)  
Books(isbn, title, author, publisher)  
Loan(empno, isbn, dat)
- What is the difference between logical data independence and physical data independence?
- Find the minimal cover for the following set of functional dependencies.  
 $A \rightarrow BC$   
 $AC \rightarrow D$   
 $D \rightarrow AB$   
 $AB \rightarrow D$
- Discuss the ACID properties of a database transaction.
- Consider the universal relation  $R = \{A, B, C, D, E, F, G, H, I, J\}$  and the set of functional dependencies  $f = \{AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ\}$ . What is the key of R? Decompose R into 2NF and then 3NF relations.

- f) Consider following 2 sets of functional dependencies.  
 $F = \{A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H\}$  and  
 $G = \{A \rightarrow CD, E \rightarrow AH\}$   
 Check whether they are equivalent.
- g) What are Armstrong Axioms? Use Armstrong Axioms to prove the soundness of decomposition rule and pseudo transitivity rule.
- h) Consider the following set of FDs for a relation  $F = \{A \rightarrow BC, CD \rightarrow E, E \rightarrow C, D \rightarrow AEH, ABH \rightarrow BD, DH \rightarrow BC\}$ . Which of these FDs are redundant?
- i) Consider the following 2 transitions.  
 T1: Read(A)  
     Read(B)  
     If  $A=0$ , then  $B=B+1$   
     Write(B)  
 T2: Read(B)  
     Read(A)  
     If  $B=0$ , then  $A=A+1$   
     Write(A)  
 Add Lock and Unlock instructions appropriately in transactions T1 and T2, so that they observe the 2 phase locking protocol. Can the execution of these transactions result in a deadlock?
- j) Consider the relation scheme  $R(ABCDE)$  and the FDs  $\{A \rightarrow B, C \rightarrow D, A \rightarrow E\}$ . Is the decomposition of R into (ABC), (BCD), (CDE) lossless?
- k) What is serializability of transaction? Explain with example.
- l) What is trigger? Explain different types of triggers.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

(16 x 2)

- Q3** Consider the following relational schema: (16)  
 DEPARTMENT (dept\_no, dept\_name, dept\_location)  
 EMPLOYEE (emp\_no, emp\_name, job, designation, manager, hiredate, salary, dept\_no)
- Find out who earns the least.
  - Which positions are paid higher than the average salary?
  - Give the details of those departments that do not have any employee.
  - Find the location of the employee named GADAA.
  - Show the details of those employees who have salaries equal to any employee of the department 30.
- Q4** Find out all candidate keys for a relation  $R(ABCDEFGH)$  with the given FD's  $\{A \rightarrow C, B \rightarrow D, G \rightarrow H, E \rightarrow F, C \rightarrow G\}$ . (16)
- Q5** Define the structure and properties of B+ Tree. Explain how the B+ tree is used as an index structure? Construct a B+ tree of order 4 with the following key values: 2, 3, 5, 7, 11, 17, 19, 23, 29, 31. (16)
- Q6** What do you mean by query optimization? Discuss in detail the various steps involved in query optimization. (16)