Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: CSPC2004

4th 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)**

a) Which key is used to show the relationship between tables?
b) What is schema?
c) Define join.
d) What is meant by specialization and generalization?
e) What do you mean by canonical cover of a set of functional dependencies?
f) Define transaction.
g) What are different modes of Lock?
h) What do you mean by multivalued attribute? Write the notation used for the same.
i) List out anomalies of 1st Normal Form.
j) 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)**

a) 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)

b) What is the difference between logical data independence and physical data independence?

c) Find the minimal cover for the following set of functional dependencies.
$A \rightarrow BC$
$AC \rightarrow D$
$D \rightarrow AB$
$AB \rightarrow D$

d) Discuss the ACID properties of a database transaction.

e) Consider the universal relation R = {A, B, C, D, E, F, G, H, I, J} and the set of functional dependencies f = {AB→C, A→DE, B→F, F→GH, D→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→C, AC→D, E→AD, E→H} and
G = {A→CD, E→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→BC, CD→E, E→C, D→AEH, ABH→BD, DH→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→B, C→D, A→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)

i) Find out who earns the least.
ii) Which positions are paid higher than the average salary?
iii) Give the details of those departments that do not have any employee.
iv) Find the location of the employee named GADAA.
v) 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 → C, B → D, G → H, E → F, C → 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)**