

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.TECH
BRANCH: CSE

SEMESTER : IV
SESSION : SP/2025

SUBJECT: CS237 DATABASE MANAGEMENT SYSTEM

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|--------|--|-------|----|
| Q.1(a) | Draw the complete architecture with component modules of a DBMS with a brief working of each module. | [5] 1 | 3 |
| Q.1(b) | Design an ER model to represent a university database with the following constraints.
The courses are distinguished with course IDs and the professors with employee Id while students have distinct roll numbers. The model must represent mapping cardinality and degree. What would be the minimum number of tables required for this database?
1. Professors can teach the same course for several semesters and each course offering is recorded.
2. Each student enrolls in exactly one course.
3. Each professor teaches at least one course while some professors may teach multiple courses | [5] 1 | 3 |
| Q.2(a) | Consider the following schema.
Suppliers (s-id, s-name, address)
Parts (p-id, s-name, color)
Catalog (s-id, p-id, cost)
Write the following query in Relational Algebra where keys are s-id, p-id, & s-id+p-id keys for Suppliers, Parts, and Catalog respectively.
1. Find the supplier name who supplies some red or green part.
2. Find the s-ids of suppliers who supply some red part and live at Delhi.
3. Find s-id of suppliers who supply red part of cost 5000/-. | [5] 2 | 3 |
| Q.2(b) | Consider the following relation
Dept(Deptno, Dname, Loc)
Emp (Empno, Ename, Job, Sal, Manager_empno, Hiredate, Comm, Deptno)
Write SQL Queries of the following
a) Display name of the employee getting 2 nd highest salary.
b) Display employee id, name, designation of those employee are getting more than all Analyst.
c) Display Employee id, Name and his manager id, name of manager of those employee whose salary is greater than his manager's salary. | [5] 2 | 3 |
| Q.3(a) | Why functional dependencies are important for database normalization, give at least two reasons. A relation TAB (A, B, C, D, E) is given along with the set of functional dependencies TAB_FD = {A-> B, D->E}. Find all the candidate keys of the relation. What are the prime attributes of the relation? | [5] 3 | 4 |
| Q.3(b) | Justify and check the normal form of the schema Books. The schema is given as Books (ISBN, Title, PubId, PubName, PubAdd). The set Book_FD is representing different functional dependencies, which are as follows:
ISBN -> { Title, PubId, PubName, PubAdd }
{Title, PubId} -> {ISBN, PubId, PubAdd}
PubName -> PubAdd | [5] 3 | 4 |

Justify whether the schema is in BCNF or not.

- Q.4(a) Describe multi-level index with suitable diagram. Mention the advantages of B+ tree over B tree for dynamic multi-level indexing. [5] 4 2
- Q.4(b) Compare static and dynamic hashing in the context of DBMS. [5] 4 2
- Q.5(a) Illustrate the need of serializability. Can the following parallel sequence be serializable, if yes, find the sequence with proper justification using the concept of conflicts and precedence graph. T1, T2 and T3 are the transactions of the sequence S. [5] 5 4

T1	T2	T3
Read(X)		
		Read(Y)
		Read(X)
	Read(Y)	
	Read(Z)	
		Write(Y)
	Write(Z)	
Read(Z)		
Write(X)		
Write(Z)		

- Q.5(b) How Validation based Protocol works for the transactions below: [5] 5 3
 (Show the start and end of different phases, assume some values and show the values in each step and state the checking performed in validation-based Protocol for the following example)

T1	T2
Read(B)	
	Read(B)
	B=B-50
	Read(A)
	A=A+50
Read(A)	
Validate	
Display(A+B)	
	Validate
	Write(B)
	Write(A)
	Display(A+B)