

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]

2+4=6 2006 May-25-0782

CSPC-415 (Database Management System)

[CSE, AI&ML, CSE, AI&DS]

B.Tech. 4th (NEP)

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt one question each from Section A, B, C and D. Section E (Question No. 9) is compulsory. Each question is of 12 marks.

SECTION - A

1. (a) Explain the three-schema architecture of a database system (external, conceptual, and internal levels). (6)
- (b) How does this architecture help achieve data independence? Provide examples. (6)

OR

2. Consider a HPTU library management system. Design an ER diagram showing entities (books, authors, members, etc.), relationships (borrowing, writing, etc.), and constraints.
 - (i) Highlight the cardinalities for each relationship.
 - (ii) Explain how you would map this ER model into a relational schema. (2×6=12)

SECTION - B

3. Consider the following relations:

EMPLOYEE (EID, ENAME, DEPTID, SALARY)

DEPARTMENT(DEPTID, DNAME, LOCATION)

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Write SQL queries for the following:

- (a) Retrieve the names of employees working in the 'Research' department.
- (b) Increase the salary by 10% for all employees in the 'Sales' department.
- (c) Display each department name and the average salary of employees in that department. (3×4=12)

OR

4. (a) What is Relational Calculus? (6)
- (b) Differentiate between Tuple Relational Calculus (TRC) and Domain Relational Calculus (DRC). Provide one example query in TRC and one example in DRC. (6)

SECTION - C

5. (a) What are Functional Dependencies? Give two real-world examples. (6)
- (b) Explain how transitive dependencies lead to anomalies. How are these anomalies addressed in higher normal forms? (6)

OR

6. (a) Discuss the concept of BCNF. (6)
- (b) How is BCNF different from 3NF? Show the decomposition of a relation into BCNF with a suitable example. (6)

SECTION - D

7. (a) Define schedules and serializability in the context of transaction management. (6)
- (b) Differentiate between conflict serializability and view serializability with examples. (6)

OR

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8. (a) What are the main database recovery techniques? (6)
(b) Explain how log-based recovery ensures atomicity and durability during system failures. (6)

SECTION - E (Compulsory)

9. Answer the following short questions (each sub-part carries 2 marks, total 12 marks):
 - (a) What is data independence, and why is it crucial in DBMS design?
 - (b) Define 1NF (First Normal Form). Provide a brief example of a violation of 1NF.
 - (c) Compare two-phase locking (2PL) with timestamp-based concurrency control in one or two sentences each.
 - (d) What does ACID stand for in transactions, and why is each property important?
 - (e) Distinguish between system failure and media failure in the context of database crashes.
 - (f) How does a foreign key constraint help maintain data consistency? (6×2=12)