BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)
B. Tech. Sem - IV CS&BS : WINTER: 2025
SUBJECT: DATABASE MANAGEMENT SYSTEMS (UE)

Day : Tuesday
Date : 25/11/2025

W-24155-2025

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY**.
2) Figures to the **RIGHT** indicate **FULL** marks.
3) Assume suitable data **WHEREVER** necessary.
4) Draw neat diagrams **WHEREVER** necessary.

Q.1 Define and explain significance of data independence in DBMS. Distinguish between logical data independence and physical data independence with suitable diagram. **(10)**

OR

Q.1 Explain the fundamental differences between a file system and a database system. What are the major advantages of using a database approach? **(10)**

Q.2 Explain the concept of relational algebra. Describe relational algebra operations such as Insert, Project, Rename, Union, Intersection, Cartesian Product with examples. **(10)**

OR

Q.2 Compare and contrast open-source DBMS (like MySQL) with commercial DBMS (like Oracle, SQL Server, DB2) in terms of features, licensing, performance, and scalability. **(10)**

Q.3 Define lossless and lossy decompositions. Give suitable examples for both. Also explain how can the decomposition be verified as lossless decomposition. **(10)**

OR

Q.3 Consider the following relation: **(10)**
Relational schema: R(student_id, s_name, c_id, c_name, instructor)
Set of functional dependencies: { student_id → s_name, c_id → c_name, instructor}

i. Identify partial and transitive dependencies in R.
ii. Normalize the relation R into 3NF.

Q.4 Define the different join strategies (nested-loop, sort-merge, hash join) in query processing. Also explain the situation where each is preferred and why with suitable examples. **(10)**

OR

Q.4 Explain how B-trees and Hashing techniques can be used for data storage in DBMS. **(10)**

Q.5 Explain two-phase locking (2PL). Show with an example how 2PL can avoid cascading rollbacks and ensure serializability. **(10)**

OR

Q.5 Compare and contrast the following concurrency control techniques: **(10)**
i) Lock-based protocols.
ii) Timestamp-based protocols.

Q.6 Write a detailed note on the following models: **(10)**
i) DAC.
ii) MAC.
iii) RBAC.

OR

Q.6 Write a detailed note on: **(10)**
i) Logical Databases.
ii) Web Databases.

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