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**MTECH**  
**(SEM I) THEORY EXAMINATION 2025-26**  
**ADVANCED DATABASE**

TIME: 3 HRS

M.MARKS: 70

**Note:** Attempt all Sections. In case of any missing data; choose suitably.

**SECTION A**

**1. Attempt all questions in brief. 02 x 7 = 14**

Q no.	Question	CO	Level
a.	What is data abstraction in DBMS?	CO1	K2
b.	Define schema and instance with an example.	CO1	K2
c.	What is an integrity constraint?	CO1	K2
d.	Define functional dependency.	CO2	K2
e.	What are ACID properties of a transaction?	CO3	K2
f.	What is a clustered index?	CO4	K2
g.	What is a distributed database?	CO5	K2

**SECTION B**

**2. Attempt any three of the following: 07 x 3 = 21**

a.	Explain ER model and relational model. How is logical database design carried out?	CO1	K3
b.	Explain relational algebra operations. Illustrate nested SQL queries with suitable examples.	CO1	K3
c.	Discuss redundancy problems in databases. Explain normalization up to BCNF.	CO2	K3
d.	Explain ACID properties and concurrent execution of transactions with suitable schedules.	CO3	K3
e.	Explain file organization and indexing techniques used in database systems.	CO4	K3

**SECTION C**

**3. Attempt any one part of the following: 07 x 1 = 07**

a.	Design an <b>ER diagram</b> for an <i>Online Examination System</i> and convert it into a relational schema with keys.	CO1	K4
b.	Write <b>SQL queries</b> to: (i) retrieve employees earning more than department average, (ii) enforce integrity using a trigger.	CO1	K4

**4. Attempt any one part of the following: 07 x 1 = 07**

a.	Given a relation with functional dependencies, normalize it up to <b>BCNF</b> and justify each step.	CO2	K4
b.	Explain <b>lossless-join</b> and <b>dependency preserving decomposition</b> with examples.	CO2	K4

**5. Attempt any one part of the following: 07 x 1 = 07**

a.	Explain serializability and recoverability. Analyze a non-serializable schedule.	CO3	K4
b.	Explain lock-based concurrency control and deadlock handling techniques.	CO3	K4

**6. Attempt any one part of the following: 07 x 1 = 07**

a.	Explain crash recovery using <b>ARIES</b> . Describe REDO and UNDO phases.	CO3	K4
b.	Explain Write-Ahead Logging (WAL) and checkpointing with an example.	CO3	K4

**7. Attempt any one part of the following: 07 x 1 = 07**

a.	Explain <b>B+ Tree indexing</b> . Discuss search, insertion, and deletion operations.	CO4	K4
b.	Design a <b>distributed database architecture</b> and discuss distributed concurrency control and recovery.	CO5	K4