APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
0520MCA102052303
Second Semester MCA (Two Years) (R, S) Examination May 2024

Course Code: 20MCA102

Course Name: ADVANCED DATABASE MANAGEMENT SYSTEMS

Max. Marks: 60   Duration: 3 Hours

PART A
Answer all questions, each carries 3 marks.   Marks

1	Explain the various levels of data abstraction in a concise manner using a diagram.	(3)
2	Demonstrate the extended ER feature specialization.	(3)
3	List down inference rules for functional dependency.	(3)
4	Define Join Dependency and Fifth Normal Form (5NF).	(3)
5	Describe various types of locks used in concurrency control methods.	(3)
6	Explain the properties of transactions.	(3)
7	Illustrate static hashing.	(3)
8	Differentiate fixed and variable length record organization.	(3)
9	Explain CAP theorem.	(3)
10	Discuss various methods to fragment data in a distributed database.	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11 a   Design an Entity Relationship Diagram for a car race database with the following   (4)
requirements.

For each car we keep its registration number (unique), engine type,   colour and
model. Each driver has unique ID, name, DoB, and age which is derived from
DoB. Drivers use cars to enter races, each race has some attributes such as the
race   number (unique), race type, the number of rounds, and date. Each driver
can enter many races and can use the same car or different one in each race. Thus

the same car can participate in many races. In the design, we want to capture which car is used by which driver and in which race.

    b   Convert ER diagram constructed in above question to relational schema.   (2)

OR

12   Demonstrate Select, Project, Union, Intersection and Join operations in relational algebra.   (6)

Module II

13   Consider the following relation.   (6)

RegNo	Sname	Cid	Cname	Mark	Grade
1	Ivan	101	DBMS	80	A
1	Ivan	102	OS	70	B
2	Dave	101	DBMS	60	C
2	Dave	102	OS	95	S
3	Smith	103	OOP	95	S
4	Dan	103	OOP	72	B
4	Dan	102	OS	83	A

Some of the functional dependencies present in this relation are RegNo --> Sname, Cid --> Cname, Mark--> Grade, {RegNo, Cid} --> Mark.

Decompose this relation into 3NF relations. Justify your answer.

OR

14   Define 4NF. Give a relation which is not in 4NF and convert it into 4NF. Justify your example.   (6)

Module III

15   Explain any problems that may occur if concurrent execution of transactions is not controlled. Use proper examples.   (6)

OR

16   How Concurrency can be controlled using Time Stamps? Explain the wait/die, wound/wait schemes for concurrency control.   (6)

Module IV

17	Demonstrate various RAID levels with diagram.	(6)

OR

18	Explain B Tree and B+ Tree index structures.	(6)

Module V

19	a	Explain MongoDB sharding.	(3)
	b	Explain MongoDB Replication.	(3)

OR

20	a	Explain Arrays and multisets in object based database with example.	(3)
	b	Explain Object Identity and Reference types in object based database with example.	(3)

****