Reg No.:_____ Name:_____

0520MCA102052201

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester MCA (2 Year) Degree Examination June 2022

Course Code: 20MCA102

Course Name: ADVANCED DATABASE MANAGEMENT SYSTEMS

Max. Marks: 60 Duration: 3 Hours

PART A

Answer all questions, each carries3 marks. Marks

1	List any three advantages of database management systems.	(3)
2	Given an ER model representing the binary relationship between two entity sets E_1 with attributes a (primary key), b, and c and E_2 with attributes x (primary key) and y, convert the model to relational model by forming a minimum number of relational schema in each of the following cases when the relationship between E_1 and E_2 is (a) one-to-one and (b) many-to- many.	(3)
3	What is meant by lossless decomposition of a relation? Give one example to illustrate.	(3)
4	Give one example of a relation which is in 3NF but not in BCNF. Justify your answer.	(3)
5	Write one example of a concurrent serializable schedule that involves two transactions T_1 and T_2. Explain why it is serializable.	(3)
6	Explain how a deadlock situation can sometimes arise while using two phase locking protocol for concurrency control.	(3)
7	RAID provides high reliability and performance. Justify your answer.	(3)
8	List out and illustrate query evaluation strategies for selection operation.	(3)
9	Briefly describe the mechanisms used in distributing data among data storage.	(3)
10	Identify the difference between MongoDB and relational databases.	(3)

PART B

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

Module I

11 FIFA wants to maintain data about various teams and matches played in the World Cup Soccer tournament. Each team is identified by the country name, which is unique. Other attributes of a team are jersey color and current FIFA ranking, which is also unique. Each team has a number of players, one of whom is the captain. For each player, a player ID has to be maintained which is unique. Consider another two attributes of the player as you feel appropriate, one of which should be multi-valued. It is also required to maintain the details of the coach of each team like his name (which is unique across all teams), date of birth, and salary in dollars. For each match, the date of the match, names of the teams and the team that won the match should be maintained (Assume each match has a decisive score, i.e., no match is drawn) along with the final score (like 2-1, 1-0, etc.). For each player, we have to maintain the number of goals scored in different matches. (6)

(a) Draw an E-R diagram to represent the E-R model for the above situation. Clearly identify primary and candidate keys of entity sets, cardinality and participation.

(b) Form the corresponding relational model clearly identifying primary and foreign keys. The number of relations should be minimum.

OR

12 Consider two relation schemas R(A, B) and S (B,C). Two relations are defined on these schemas as r(R) and s(S). (6)

(a) Using the basic relational algebra operations select, project, union, set difference, cartesian product and rename (Note: You may or may not need all of these operations), write relational algebra expressions for: (i) Natural join $r \bowtie s$ and (ii) $\pi_B (r) \cap \pi_B (s)$.

(b) Illustrate the difference between inner join and outer join operations by using some instances of r (R) and s (S).

Module II

13 Given a relation schema R (ABCDEFGHIJ) with a set of FDs F = {AB→C, A→DE, B→F, F→GH, D→IJ }. (6)

(a) Determine the key for R

(b) Decompose R into 2NF relations.

OR

14 Consider the following relational schema ***Professor_Course(pid, cid, pname, poffice, pcode, cname, cred)***. Let a relation be defined on the schema to store information about professors who are assigned to teach different courses. A professor is described by a unique ID ***pid***, name ***pname***, postal name ***poffice***, and pincode ***pcode*** and a course is described by a unique course ID ***cid***, course name ***cname***, and course credit ***cred.*** Assume that a course can be taught jointly by more than one professor and one professor can teach more than one course in a semester. Normalize the above schema such that the normalized schema is in second normal form (2NF). Check whether the normalized schema is in third normal form (3NF). If not, obtain a normalization so that all schemas are in 3NF. (6)

Module III

15 Consider the following set of three transactions: (6)

T1: r(x); r(z); w(x); w(y); w(z)

T2: r(z); r(y); w(z); w(x)

T3: r(x); r(y); w(y); w(z)

For the above three transactions, generate non-trivial (i.e., not serial unless that is the only way) serializable schedule using 2PL. Clearly identify the corresponding serial schedules and the conditions that determine the order of the equivalent serial schedules.

OR

16 Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. (6)

a. State whether each schedule is serializable or not.

b. For each serializable schedule, write down at least one possible equivalent serial schedule.

T1: r1(x); r1(z); w1(x)

S1: r1(x); r2(z); r1(z); r3(x); r3(y); w1(x); w3(y); r2(y); w2(z); w2(y)

S2: r1(x); r2(z); r3(x); r1(z); r2(y); r3(y); w1(x); w2(z); w3(y); w2(y)

Module IV

17 Briefly explain with the help of an example, the difference between B-Tree and B+ Tree indexing techniques. (6)

OR

18 Explain (a) Open hashing and (b) Closed hashing (6)

Module V

19 Explain the main features of replication and sharding of MongoDB? (6)

OR

20 What is CAP theorem? Explain. (6)

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