Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (W), Mumbai : 400058, India

(Autonomous College of Affiliated to University of Mumbai)

End Semester Examination

December 2022

Max Marks: 100 Duration: 3 hours

Class: F.Y.MCA Semester: I

Course code: PC MC502

Name of the course: Database Management System

Instruction:
(1) All questions are compulsory
(2) Draw neat diagrams
(3) Assume suitable data if necessary
(4) Mention the question number clearly while writing the answer

Q No		Max Marks	CO	BL
1a	List four responsibilities of a database-management system. For each responsibility,explain the problems that would arise if the responsibility were not discharged.	4	1	3
1b	Draw and explain the detailed system architecture of DBMS.	6	1	3
1c	Give various of constraints of relationship	2	1	4
1d	Draw an ER diagram for the education database that contains the information about an inhouse company education training scheme. The relevant relations are: Course (course-no, title) Offering (course-no, off-no, off-date, location) Teacher (course-no, off-no, emp-no) Enrolment (course-no, off-no, stud-no, grade) Employee (emp-no, emp-name, job) Student (stud-no, stud-name, ph-no)	8	1	4
2a	Why BCNF is more desirable than 3NF?	3	2	4
2b	Consider relation R=(A, B, C, D, E, F) having set of FD's $A \rightarrow B$ $A \rightarrow C$ $C \rightarrow D$ $B \rightarrow E$ $AC \rightarrow F$ Calculate some closures as $\{A\}^+$,$\{B\}^+$,$\{AC\}^+$and also find key of above relation.	7	2	5
2c	Given the schema Item(<u>itemid</u>, name, category, price) Itemsale(<u>transid</u>, <u>itemid</u>, qty) Transaction(<u>transid</u>, custid, date) Customer(<u>custid</u>, name, street-addr, city) where primary keys are underlined, write the following queries in relational algebra: a. Find the name and price of the most expensive item (if more than one itemis the most expensive, print them all).	10	5	3

	b. Print the total sales (in terms of units and total price) of every item categoryin every customer-city. c. Find items with no sales at all to customers in Mumbai. d. Find customers who bought the same quantity of the same item on subsequent dates. e. Find all customers who did not buy any item in category "Electronics".			
3a	During its execution, a transaction passes through several states, until it finally commits or aborts. List all possible sequences of states through which a transaction may pass.	04	3	4
3b	When you withdraw money from an ATM or when you do transactions online it follows some set of rules of ACID properties, discuss the online transactions in detail.	06	3	4
3c	Write the following queries in SQL, using the Employee schema. Employee (eid, ename, address, city) Works (eid, cid, salary) Company (cid, cname, city) a. Modify database so that John now lives in Mumbai b. Find Employees who live in same city as the company for which they work. c. Give all employees of "AZ Corporation" where there is increase in salary by 15%. d. Find the names of all employees, company name and city of residence such that Employee name begins with S. e. Delete all tuples in works relation for employees of small bank corporation.	10	5	3
4a	What is 2-phase locking protocol? How does it guarantee serializability?	10	3	5
4b	Explain timestamp based protocol and how it is used to control concurrency. OR Suppose that we decompose the schema R = (ABCDE) into (ABC),(ADE). Show that this decomposition is a lossless-join decomposition, if the following set F of functional dependency holds: A->BC, CD->E, B->D, E->A Also find out the candidate key.	10	2,3	4
5a	Consider the following schema. Employee (eid, name, department, designation, salary) Create a trigger on employee table whenever new employee is added a comment is written to EmpLog Table.	06	6	3
5b	What is Shadow paging scheme? Where it is used?	04	3	3
5c	Which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock? Explain the following: a. 2-phase locking b. Time-stamp ordering Consider the transactions T1, T2, and T3 and the schedules S1 and S2 given below.	10	3,4	4

	T1: r1(X);r1(Z);w1(X);w1(Z) T2: r2(Y);r2(Z);w2(Z) T3: r3(Y);r3(X);w3(Y) 3 S1: r1(X);r3(Y);r3(X);r2(Y);r2(Z); w3(Y);w2(Z);r1(Z);w1(X);w1(Z) S2: r1(X); r3(Y); r2(Y); r3(X); r1(Z); r2(Z); w3(Y); w1(X); w2(Z); w1(Z) Analyze which one of the schedules is conflict-serializable? OR Describe the various parallel database architectures			