NARULA INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT

2023
DATABASE MANAGEMENT SYSTEM
CS503

TIME ALLOTTED: 3HR **FULL MARKS:70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

Sl		Question	Marks	CO No.
	(i)	In the relational modes, cardinality is termed as a) Number of tuples b) Number of attributes c) Number of tables d) Number of constraints	01	CO4
	(ii)	Cartesian Product in relational algebra is a) Unary operator b) Binary operator c) Ternary operator d) Not defined	01	CO4
	(iii)	Which of the following operation is used if we are interested in only certain columns of a table? a) PROJECTION b) SELECTION c) UNION d) JOIN	01	CO4
	(iv)	For R = {J, K, L} F = {JK –>L, L –> K } the candidate keys are a) J and K b) JK c) Only J d) JK and JL.	01	CO3
	(v)	Which of the following is a trivial functional dependency? a) $X \rightarrow Y$ b) $Y \rightarrow X$ c) $XY \rightarrow Y$ d) $XY \rightarrow Z$	01	CO3
	(vi)	Which one of the following is used to define the structure of the relation, deleting relations? a) DML(Data Manipulation Language) b) DDL(Data Definition Language) c) Query d) Relational Schema	01	CO5
	(vii)	Which of the following statements is true? a) An equi-join is a theta join b) A natural join is a equi-join c) A natural join is a theta join d) All of the above	01	CO4
	(viii)	A characteristic of an entity is	01	CO2

a)Relation
b)Attribute
c)Parameter
d) Constraint

(ix) If the state of the database no longer reflects a real state of the world that the database is supposed to capture, then such a state is called   01   CO4
a) Consistent state
b) Parallel state
c) Atomic state
d) Inconsistent state

(x) In case of entity integrity, the primary key may be   01   CO2
a) Null
b) Not Null
c) both Null & not Null
d) Any Value

(xi) When the transaction finishes the final statement the transaction enters into   01   CO4
a) Active state
b) Committed state
c) Partially committed state
d) Abort state

(xii) Using relational algebra the query that finds customers, who have a balance of over 1000 is   01   CO4
a) $\pi_{Customer\_name}(\sigma_{balance > 1000}(\text{Deposit}))$
b) $\pi_{Customer\_name}(\sigma_{balance >= 1000}(\text{Deposit}))$
c) $\pi_{Customer\_name}(\sigma_{balance > 1000}(\text{Borrow}))$
d) $\sigma_{Customer\_name}(\pi_{balance > 1000}(\text{Borrow}))$

GROUP – B
(Short Answer Type Questions)
(Answer any *three* of the following)   **3 x 5 = 15**

Sl		Question	Marks	CO No.
1.	(a)	What is data independence?	2	CO1
	(b)	Explain various types of data model.	3	CO1
2.		Explain generalization, specialization and aggregation.	5	CO2
3.		Explain the following terms: a) Functional dependency b) Prime and Non prime attribute.	5	CO3
4.		Explain different states of transaction.	5	CO4
5.	(a)	What is locking?	2	CO4
	(b)	What is two phase locking protocol?	3	CO4
6.		Illustrate deadlock in transaction with example.	5	CO4

GROUP – C
(Long Answer Type Questions)
(Answer any *three* of the following)   **3 x 15 = 45**

Sl		Question	Marks	CO No.
7.	(a)	Explain three level architecture of DBMS	4	CO1
	(b)	What are the differences between weak entity and strong entity?	4	CO2
	(c)	Design a database for a college. Many students seek admission in the college. The college has a number of departments and students can be enrolled to these departments. The department also offers a number of courses to the students, each with a different duration from the other. Each department has its H.O.D and many teachers under him. The syllabus of each course is also defined. Teachers are recruited by the college for teaching the said courses to the students. The teachers may have different qualifications and experience. They may also teach different subjects if required. Each student in the college has a unique ID. We need to store the names of the students studying in the college, their residential address, date of birth. We also need to store information about the college like the name, address, contact number, reference ID, departments of the college, name of the H.O.D, number of teachers and students in the department. Also, the courses offered by the departments, the syllabus, the duration and the course ID. We can also store information about the teachers like their qualification, experience, name and subjects taught. Draw ER Diagram for this case study.	7	CO2
8.	(a)	What is trivial and non-trivial functional dependency (FD)?	02	CO3
	(b)	Given a set of FDs for the relation schema R (A,B,C,D,E). The FDs are {BC—>D, AC—>BE, B—>E}. Explain and find out the highest normal form of R.	04	CO3
	(c)	Consider a schema R(A,B,C,D) and functional dependencies A—>B and C—>D. Check whether the decomposition of R into R1(AB) and R2(CD) is lossless and/or dependency preserving or not.	04	CO4
	(d)	Consider the following two transactions :	05	CO4

T1 :   Read (A); Read (B);
If A = 0 then B : = B + 1; Write (B);
T2 :   Read (B); Read (A);
If B=0 then A : = A + 1; Write (A);
Add lock and unlock instructions to transactions T1 and T2, so they observe the two-phase locking protocol.
Can the execution of these transactions result in a deadlock?

| 9. | | Write SQL statements for following: | 15 | CO3 |

Student(Enrno, name, courseId, emailId, cellno)
Course(courseId, course_nm, duration)
i) Add a column city in student table.
ii) Find out list of students who have enrolled in "computer" course.
iii) List name of all courses with their duration.
 iv) List name of all students start with 'a'.
 v) List email Id and cell no of all mechanical engineering students.

10.	(a)	Consider the following two schedules. Check whether both of these schedules are conflict-serializable? Explain why or why not. S1: R1(X) R1(Y) R2(X) R2(Y) W2(Y) W1(X) S2: R1(X) R2(X) R2(Y) W2(Y) R1(Y) W1(X)	04	CO4
	(b)	Illustrate 3NF and BCNF.	05	CO3
	(c)	Consider the relational database as given below and write down expressions in relational algebra for the following queries. Data_Master(data_id, item name, reorder level) Data_Details (data_id, Supplier_id, Purchase_date, Qty, Utcost) i) Select supplier id where purchase date is 4th December, 2022) ii) Select the minimum quantity sold. iii) Select name of the item where supplier id is 'S00001'	06	CO4
11.		Short Note: (Any three)	03*5	CO1,CO5
	(a)	Database languages		
	(b)	Keys in DBMS		
	(c)	Armstrong' axioms for FD's.		
	(d)	Inner Join Outer Join		
	(e)	Advantages of DBMS		