NARULA INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT

DATABASE MANAGEMENT SYSTEM
CS503

TIME ALLOTTED: 3 HOURS   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

GROUP – A
(Multiple Choice Type Questions)

1. Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

SL. NO.	Question	Marks	CO
(i)	Relational algebra is a a) procedural language b) non-procedural language c) data definition language d) high level language	1	3
(ii)	What relationships does Referential integrity control? a) Attributes in a table b) Operations of an object c) Instances of a class d) Tables in a database	1	3
(iii)	Which one of the following statements is false? a) The data dictionary is normally maintained by the database administrator. b) Data elements in the database can be modified by changing the data dictionary. c) The data dictionary contains the name and description of each data element. d) The data dictionary is a tool used exclusively by the database administrator.	1	1
(iv)	The entity integrity constraint sates that a) no primary key value can be null b) a part of the key may be null c) duplicate object values are allowed d) none of these	1	3
(v)	In 2-phase locking a transaction must a) release all it locks at the same time b) NOT obtain any new locks once it has started releasing locks c) only obtain locks on items not used by any other transactions d) ensure that deadlocks will never occur.	1	4
(vi)	Serializability of concurrent transactions are ensured by a) locking	1	4

b) time-stamping

c) both of these

d) none of these.

(vii)	Which of the following is true?	1	2

   a) A super key is always a candidate key

   b) Every 3NF schema is also in BCNF

   c) Generalization is a bottom-up design approach

   d) None of these.

(viii) Which one of the following is used to define the structure of the relation, deleting relations and relating schemas?

   a) DML(Data Manipulation Language)

                                      1   1

   b) DDL(Data Definition Language)

   c) Query

   d) Relational Schema

(ix) For R = { J, K, L } F = { JK –>L L –> K } the candidate keys are   1   2

   a) J and K

   b) JK

   c) only J

   d) JK and JL.

(x) Which one of the following is correct?   1   2

   a) All functional dependencies are many-to-many relationships

   b) All functional dependencies are many-to-one relationships

   c) All functional dependencies are one-to-one-relationships

   d) None of these.

(xi) Buffer Manager is a program module   1   5

   a) Which provides the interface between the low-level data stored in database, application programs and queries submitted to the system.to retrieve rows

   b) Which is responsible for fetching data from disk storage into main memory and deciding what data to be cache in memory.

   c) Which ensures that database, remains in a consistent state despite system failures and concurrent transaction execution proceeds without conflicting.

   d) Which manages the allocation of space on disk storage and data structure used to represent information stored on a disk.

(xii) Which of the following is the way to undo the effects of an aborted transaction?   1   4

   a)   Compensation transaction

   b)   Roll back

   c)   Recovery

   d)   Error control.

GROUP – B[*]

(Short Answer Type Questions)

Answer any *three* from the following: 3×5=15

2.	a	What is the difference between serial and serializable schedule? Illustrate with example.	2	4
	b	Give the serial schedule of the following schedule S (First check if it's view serializable or not). $S : R_1(A) , W_2(A) , R_3(A) , W_1(A) , W_3(A)$	3	4
3.	a	What is the need for normalization?	2	2
	b	Find out the highest normal form of relation scheme R(A, B, C, D) along with the set of functional dependencies F = {AB → C, AB → D, C → A, D → B}.	3	2
4		Consider a schema R(A, B, C, D) and functional dependencies A -> B and C -> D. Then the decomposition of R into R1 (A, B) and R2(C, D).Explain whether the decomposition is dependency preserving and loss less join ?	5	2
5.		Consider the following relations and solve the query using relational algebra: Student(<u>Roll</u>, Dept,Name, Addr) Course(<u>Course_ID</u>, Roll, Dept, Course_name, duration, Instructor_ID) Instructor(<u>Instructor_ID,</u> Instructor_Name, Instructor_dept,Salary) a) Display student roll, dept, name and their corresponding course_name and duration of course) b) Display all the courses offered and their corresponding Instructor details. c) Display maximum salary of the instructor department wise.	5	3
6.		What is compensating transaction and why is it required?	5	4

GROUP – C*
(Long Answer Type Questions)

Answer any *three* from the following: **3×15=45**

7.	(a)	Consider the following relation REFRIG (Model #, Year, Price, Manuf_plant, Color) and with the following dependencies: F = { M→MP, {M,Y} → P, MP→C} Evaluate each of the following as a candidate key for REFRIG, giving reasons why it can or cannot be a key : { M }, {M, Y }, { M, C }	5	2
	(b)	Based on the above key determination state whether this relation is in BCNF or in 3NF, giving proper reasons.	5	2
	(c)	Let T1, T2 and T3 be transactions that operate on the same data items A, B and C. Let r1(A) mean that T1 reads A, w1(A) means that T1 writes A and so on for T2 and T3. Consider the following schedule: S1 : r2(c), r2(B), w2(b), r3(B), r3(C), r1(A), w1(A), w3(B), w3(C), r2(A), r1(B), w1(B), w2(A) Is the schedule serializable?	5	4

8.	(a)	Explain the ACID property of transaction.	5	4
	(b)	Explain the 2 Phase locking protocol. What benefit does strict two-phase locking provide? What is the disadvantage of it?	5	4
	(c)	What is deadlock in transaction? How to detect deadlock in a system? Explain with diagram.	5	4
9.	(a)	Construct an E-R diagram for the following problem: A store has different counters managed by different employees. A counter has different items, but no two counters have common items. Customers buy from different counters but bills are prepared at bill counter only. Once in a month performance of persons managing counters is evaluated in terms of sales.	8	1
	(b)	What is weak entity set? Explain with example.	3	1
	(c)	What is multivalued dependencies? Explain with example.	4	2
10.	(a)	Consider the relational database of *employee* (*person-name*, *street*, *city*) *works* (*person-name*, *company-name*, *salary*) *company* (*company-name*, *city*) *manages* (*person-name*, *manager-name*) Give an expression in the relational algebra for each request: **a.** Modify the database so that Jones now lives in Newtown. **b.** Give all employees of First Bank Corporation a 10 percent salary raise. **c.** Give all managers in this database a 10 percent salary raise. **d.** Give all managers in this database a 10 percent salary raise, unless the salary would be greater than $100,000. In such cases, give only a 3 percent raise. **e.** Delete all tuples in the *works* relation for employees of Small Bank Corporation.	10	3,5
	(b)	Explain weak and strong entity with an example.	5	1
	(c)	Consider a schema R(X, Y, Z, W) and functional dependencies FD = { X -> Y and Z -> W }. Then the decomposition of relational schema R into relation R1(X Y) and relation R2(Z W). Whether this decomposition is lossless or lossy join decomposition.	5	2
11.	(a)	Explain trival and non trival functional dependencies?	5	2
	(b)	Consider insertion sequence: 8, 5, 1, 7, 3, 12, 9, 6, 20, 13. Construct B+ Tree.	5	
	(c)	Consider the file with r = 30000 records (fixed-length) of size R = 100 bytes stored on a disk with block size B= 1024 bytes. Suppose each index entry in index file takes 15 (9 bytes for index value, 5 bytes for pointer) bytes. What is the number of accessing blocks for clustering index?	5	5