KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: APRIL /MAY 2024

(Regulation 2018)

Fourth Semester

INFORMATION TECHNOLOGY

U18ITI4303: Data Base Management Systems

COURSE OUTCOMES

CO1: Outline an ER model for a defined problem.
CO2: Explain the basic concepts of query processing and query optimization algorithms.
CO3: Describe the concepts of transaction and storage management.
CO4: Explain the basic concepts of database security and NoSQL.
CO5: Design a database for a given problem.
CO6 Develop an RDBMS application.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
**PART A (10 x 1 = 10 Marks)**

1. Matching type item with multiple choice code   CO1   [K$_2$]

List I	List II
A.System Catalog	i. Data abstraction
B.Database Administrator	ii. Consistency maintenance
C. Transaction Manager	iii. Data Dictionary
D. Three schema architecture	iv. Performance monitoring

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	ii	iv	iii	i
d)	iii	i	ii	iv

2. Consider the following ER diagram   CO1   [K$_3$]
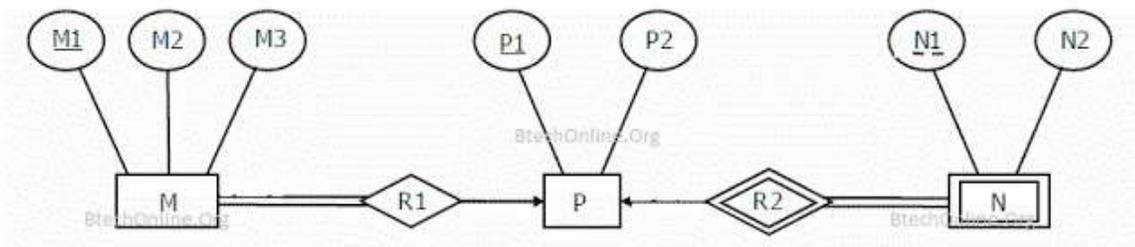
The minimum number of tables needed to represent M, N, P, R1, R2 is 3.
Given the basic ER and relational models, which of the following is INCORRECT?

a) An attribute of an entity can have more than one value

b) An attribute of an entity can be composite

c) In a row of a relational table, an attribute can have more than one value

d) In a row of a relational table, an attribute can have exactly one value or a NULL value

3. Which of the following statements on the view concept in SQL are invalid?   CO6   [K₃]

   1. All views are not updateable
   2. The views may be referenced in an SQL statement whenever tables are referenced.
   3. The views are instantiated at the time they are referenced and not when they are defined.
   4. The definition of a view should not have GROUP BY clause in it.

   a) 1 only   b) 4 only
   c) 3 and 4 only   d) 1 and 3 only

4. The relation schema Student_Performance (name, courseNo, rollNo, grade) has the following FDs   CO6   [K₃]

   name,courseNo->grade

   rollNo,courseNo->grade

   name->rollNo

   rollNo->name

   The highest normal form of this relation scheme is

   a) 2NF   b) 3 NF
   c) BCNF   d) 1 NF

5. Assertion (A): In primary, the search key defines the sequential order of the file   CO2   [K₂]

   Reason (R): The records are accessed randomly in ordered index

   a) Both A and R are Individually true and R is the correct explanation of A

   b) Both A and R are Individually true but R is not the correct explanation of A

   c) A is true but R is false

   d) A is false but R is true

6. The physical location of a record is determined by a mathematical formula that transforms a file key into a record location is   CO2   [K₂]

   a) B-Tree File   b) Hashed File
   c) Indexed File   d) Sequential file

7. Arrange the steps involved in shadow paging in the correct order   CO3   [K₂]

   1. Copy-on-write
   2. Transaction commits

3. Original page is updated

4. Pointer switch

a) 2-3-4-1   b) 1-3-2-4

c) 3-4-2-1   d) 4-1-3-2

8. Immediate database modification technique uses   CO3   [K$_2$]

a) Both undo and redo.   b) Undo but no redo.

c) Redo but no undo   d) Neither undo nor redo

9. Assertion (A): Eventually consistent non-relational databases prioritize availability and partition   CO4   [K$_2$]
    tolerance over strict consistency.

    Reason (R): In distributed systems, achieving strict consistency across all nodes can lead to
    increased latency and reduced availability, so eventually consistent databases sacrifice strict
    consistency for better performance and availability.

a) Both A and R are Individually true and R   b) Both A and R are Individually true but R
    is the correct explanation of A   is not the correct explanation of A

c) A is true but R is false   d) A is false but R is true

10. In which type of NoSQL database can you typically find flexible, schema-less data formats like   CO4   [K$_2$]
    JSON or BSON?

a) Key-Value Stores   b) Document Stores

c) Column-Oriented Databases   d) Eventually Consistent Databases

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11.	Summarize how to achieve data abstraction in DBMS.	CO1	[K$_2$]
12.	Write the significance of foreign key?	CO6	[K$_2$]
13.	The employee information in a company is stored in the relation	CO5	[K$_3$]

Employee (name, sex, salary, deptName)

Write the SQL query for the average salary of male employees is more than the average salary in the
company

14.	Outline the problem of Spurious tuples and how to prevent it.	CO5	[K$_2$]
15.	How the performance and reliability improvement is achieved in RAID.	CO3	[K$_2$]
16.	Compare primary index and secondary index?	CO3	[K$_2$]
17.	What is partial commit state in transaction?	CO3	[K$_1$]
18.	Differentiate strict two phase locking protocol and rigorous two phase locking protocol.	CO3	[K$_2$]
19.	Compare authentication and authorization in database security	CO4	[K$_2$]
20.	List the process of CRUD operations in the context of NoSQL databases	CO4	[K$_1$]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 350 words)

21.	a)	How to achieve abstraction in DBMS? Explain.	7	CO1	[K$_2$]
	b)	In an organization several projects are undertaken. Each projects can employ one or more employees. Each employee can work on one or more projects. Each project is undertaken on the required of client. A client can request for several projects. Each project have only one client. A project can use a number of items and an item may be used by several projects. Draw an E-R diagram	7	CO1	[K$_3$]
22.	a)	Explain first, second and third normal forms and Find 3NF decomposition of the relation scheme R = {Faculty, Dean, Dept, Chairperson, Professor, Rank, Student} with the set of functional dependencies, F = {Faculty →Dean, Department →Chairperson, Professor →Rank, {Chairperson, Department} →Faculty ,Student →{Department, Faculty, Dean}, Dean →Faculty, {Professor, Rank} →{Department, Faculty} }	7	CO5	[K$_3$]
	b)	Consider the following relations with key underlined lives (person_name, street, city) works (person_name, company_name, salary) located (company_name, city) manages (person_name, manager_name) Write SQL Queries for the following: **(i)** Find the names and city of persons who work for manager John. **(ii)** John's manager has changed. The new manager is Anna. **(iii)** Susan doesn't work anymore. **(iv)** Create a view BangWork (person_name, company_name, manager_name) of all people who work in Bangalore in ascending order of person name	7	CO6	[K$_3$]
23.	a)	What do you understand by RAID? Explain RAID Level 0 and Level5	7	CO3	[K$_2$]
	b)	Suppose there is a hash function h(x)= x mod 8. Show the hash structure for a file with the following key values 2,5,7,26,13,20,38,40,50,18,74. Assume a bucket size of 2 records	7	CO3	[K$_3$]
24.	a)	What are deferred modification and immediate modification technique for recovery? Explain.	7	CO3	[K$_2$]
	b)	Summarizes the different versions of two phase locking protocols	7	CO3	[K$_2$]
25.	a)	Describe the Discretionary Access Control (DAC) model in database security. Provide an example scenario where DAC is applied and explain how it works.	7	CO4	[K$_2$]
	b)	Describe the distributed storage architecture of HBase. Explain how HBase ensures fault tolerance and scalability in distributed environments	7	CO4	[K$_2$]
26.	a)	Write an algorithm for B+ tree insertion and create B+ tree for the following elements 1,4,7,10,17,21,31,25,19,20,28,42 with n=4.	7	CO3	[K$_3$]
	b)	What is constraints? Explain the primary key, check and foreign key in SQL with an example for each. Give the syntax.	7	CO6	[K$_2$]

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