KUMARAGURU
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MCA DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2020)

First Semester

MASTER OF COMPUTER APPLICATIONS

P20CAT1002 : Database Technologies

COURSE OUTCOMES

CO1: Use the techniques, components and tools of a typical database management system.

CO2: Understand basic database concepts, including the structure and operation of the relational data model.

CO3: Demonstrate the different types of database implementation concepts.

CO4: Understand the emerging database technologies.

CO5: Familiarize with NoSQL concepts.

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

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

1. Which of the following will help to maintain unique record in the table?   CO1 [K1]
   - a) Foreign Key
   - b) Primary Key
   - c) Composite Key
   - d) Alternate Key

2. Which type of entity cannot exist in the database unless another type of entity also exists in the database, but does not require that the identifier of the other entity be included as part of its own identifier?   CO1 [K2]
   - a) ID-dependent entity
   - b) ID-independent entity
   - c) Weak entity
   - d) Strong entity

3. Each database system supporting ODBC provides a/an   CO2 [K1]
   - a) Interface
   - b) Library
   - c) Modules
   - d) Virtual Memory

4. Match the terms   CO2 [K3]

List I	List II
A. BCNF	i. removes multivalued dependency
B. 3 NF	ii. not always preserving dependency
C. 2 NF	iii. removes transitive dependency
D. 4 NF	iv. removes partial functional dependency

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

5. If a transaction does not modify the database until it has committed, it is said to use the _____ technique   CO3 [K2]
   - a) Late-modification
   - b) Deffered-modification
   - c) Immediate-modification
   - d) Undo-modification

6. Suppose a database system crashes again while recovering from a previous crash.   CO3 [K3]

Assume checkpointing is not done by the database either during the transactions or during recovery. Which of the following statement is correct?

a) The same undo and redo list will be used while recovering again

b) The database will become inconsistent

c) All the transactions that are already undone and redone will not be recovered again

d) The system cannot recover any further

7. Assertion (A): Trigger is a statement that is executed automatically by the system as a side effect of a modification to the database
Reason (R): Cursors in SQL is a database object   CO4   [K$_2$]

a) Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A)

b) Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A)

c) Assertion (A) is true and Reason (R) is false

d) Assertion (A) is false and Reason (R) is true.

8. Which database handles full text data, image, audio and video?   CO4   [K$_2$]

a) Multimedia

b) Video on demand

c) Graphics

d) Transaction

9. Salary information about the manager are hidden from the employee is called   CO5   [K$_2$]

a) Physical-based data hiding

b) Network-based data hiding

c) Conceptual-based data hiding

d) Internal-based data hiding

10. Amongst which of the following is used to create backup of database in MongoDB?   CO5   [K$_2$]

a) mongotruncate command

b) mongoexport command

c) mongodump command

d) mongoimport command

PART B (10 x 2 = 20 Marks)

11. What is database schema and data independence?   CO1   [K$_1$]
12. Define the terms: Cardinality mapping and Degree of a relation.   CO1   [K$_1$]
13. "Boyce-Codd normal form is found to be stricter than third normal form". Justify the statement.   CO2   [K$_2$]
14. Suppose you are given a relation R = (A, B, C, D, E) with the following functional dependencies {CE→D, D→B, C→A}. Find all the candidate keys.   CO2   [K$_3$]
15. Consider the transactions T1 and T2 given in the Figure. Will transaction T2 read the correct value of X if transaction T1 fails? Justify.   CO3   [K$_5$]

Time	T1	T2

↓	read_item(X);
	 X=X-N;
	
	 write_item(X);
	 read_item(Y);
	
	 Y=Y+N;
	 write_item(Y);
		read_item(X);
		 X=X+M;
		
		 write_item(X);

16. Assume that you are the DBA for the Toy Company. Create a relation called Employees with fields ename, dept and salary. For authorization reasons, you also define views EmployeeNames (with ename as the only attribute) and DeptInfo with fields dept and avgsalary. The latter lists the average salary for each department. Show the appropriate SQL statement for granting privileges to a user who needs to know only average department salaries for HR and Manufacturing departments?   CO3   [K$_4$]

17.	Justify how homogeneous data model is differ from heterogeneous data model?	CO4 [K$_4$]
18.	"Database trigger will fire when the table is modified". Justify.	CO4 [K$_3$]
19.	State the differences between SQL and NoSQL databases.	CO5 [K$_2$]
20.	What is aggregation data model?	CO5 [K$_1$]

PART C (6 x 5 = 30 Marks)

21.	Discuss the main characteristics of the database approach and how it differs from the traditional file systems.	CO1 [K$_2$]

22.	Consider the ER diagram represented in the figure Convert ER diagram into tables for the following scenarios.
	  I. The cardinality is Many to Many.
	  II. The cardinality between Student and Course is One to Many.
		CO1 [K$_6$]
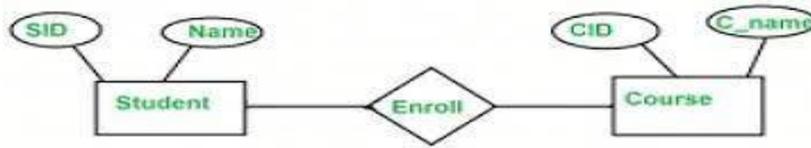
23.	For the following relation schema: employee (employee-name, street, city)
	works (employee-name, company-name, salary)
	company (company-name, city)
	manages (employee-name, manager-name)
	Give an expression in SQL for each of the following queries.
	  I. Find the names, street address and cities of residence for all the employees who work for the "First Bank" and earn more than Rs. 10000
	  II. Find the names of all employees in the database who live in the same cities as the companies for which they work.
		CO2 [K$_5$]

24.	How waif-die method differ from wound –waif method? Explain.	CO3 [K$_3$]
25.	Discuss about multimedia database with its issues.	CO4 [K$_2$]
26.	What is sharding and replication. Explain.	CO5 [K$_2$]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27.	Consider a Conference review database in which researchers submit their research papers for publication in the conference proceedings. Each paper is then reviewed by reviewers. Comments of these reviewers are recorded for use in the paper selection process. The database system caters primarily to reviewers who record answers to evaluation questions for each paper they review and make recommendations regarding whether to accept or reject the paper. The database requirements are summarized as follows.
	  1. Authors of papers are uniquely identified by Author Id, first and last name, affiliation, email address, phone number, and mailing address are also recorded.
	  2. Each paper is assigned a unique identifier and is described by its title, an abstract and the name of the file for the paper.
	  3. It is possible that.
	    o An author may have multiple papers in the conference.
	    o A paper may have multiple authors.
	  4. Each paper has a contact author. However,
	    o Although a paper may have multiple authors but only one of the
		CO1 [K$_4$]

authors will be the contact author for that paper.
- An author can be a contact author for multiple papers.

5. Each paper needs to be submitted to the conference by an author. If a paper has multiple authors even, then only one of the authors will submit the paper. It is possible that an author may submit multiple papers.

6. It is also possible that an author submits a paper, but he/she is not the contact person for that paper.

7. The system also keeps track of the reviewers. Each reviewer is uniquely identified by the identifier. Each reviewer's first name, last name, email address, and affiliation are also recorded. Authors are not allowed to be reviewers.

8. Each reviewer is assigned multiple papers for review. Each paper is assigned, multiple reviewers.

9. A reviewer rates each paper assigned to him/her on a scale of 1 to 10 in four categories: technical merit, readability, originality, and relevance to the conference. Finally, each reviewer provides an overall recommendation (Accept or Reject) regarding each paper that he/she reviews.

10. Each review contains two types of written comments: one to be sent to the author and the other to be shared with the review committee chair only.

Design an ER diagram for this application. List out any unspecified requirements and any assumptions that is needed to make the specification complete.

28. The following table is constructed to store the details of the books in a Library. The ISBN number is unique for each book.   CO2   [K₅]

Author ID	Author Name	ISBN Number	Book Name	Price	Publisher ID	Publisher	Publisher City
{A1, A2}	{Stephens, Hillyer}	99921-5810-7	Database Design	4930	P1	Macmillan Publishers	Delhi
A3	Russell	99715-0210-0	Unix	6000	P2	Morgan Kaufmann	Chennai
A3	Russell	99715-1234-5	Operating Systems	8560	P3	Apress	Delhi
A4	Talukder	99921-3421-9	Computer Architecture	3490	P1	Mc Graw Hill	Delhi

Perform the following on the above table.
i. Identify the primary key and all functional dependencies.
ii. Identify the update anomalies
iii. Normalize the table so that all resulting tables are in 3NF stating the definitions of various normal forms

29. Write about two phase locking protocol in detail. How does it guarantee serializability?   CO3   [K₃]

30. Explain about triggers and active databases in DBMS.   CO4   [K₄]

31. Give a note on the following   CO5   [K₂]
i. NOSQL data base
ii. Key-Value Model
iii. Document Data Model

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