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RV COLLEGE OF ENGINEERING®
(An Autonomous Institution affiliated to VTU)
V Semester B. E. Examinations Nov/Dec-19
Computer Science and Engineering
DATABASE DESIGN

Time: 03 Hours

Maximum Marks: 100

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
 2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

QUESTION		MARKS
1.1	Find the minimal cover for following set of functional dependencies. $P \rightarrow L, P \rightarrow CA, LC \rightarrow AP, A \rightarrow LC$	02
1.2	For the following <i>EMP</i> relation <i>EMP(E_ID, Ename, DeptNo)</i> , display the names of all employees whose names include either of the substring "TH" or "LL".	02
1.3	Differentiate the working of the following aggregate functions: <i>COUNT(*)</i> and <i>COUNT(COLUMN_NAME)</i> .	02
1.4	Determine the key for the following relation $R = \{A, B, C, D, E, F, G, H, I\}$ with respective to following set of functional dependencies: $A \rightarrow BH, BC \rightarrow E, ED \rightarrow AF, G \rightarrow IH, FH \rightarrow CG$	02
1.5	A relation is in _____ normal form if an attribute of a composite key is dependent on an attribute of other composite key.	02
1.6	List the two conditions that decides that given <i>MVD</i> $X \twoheadrightarrow Y$ is a trivial <i>MVD</i> .	02
1.7	List different types of attributes in <i>ER</i> diagram and specify their <i>ER</i> notations.	02
1.8	The following table has two attributes <i>A</i> and <i>C</i> where <i>A</i> is the primary key and <i>C</i> is the foreign key referencing <i>A</i> with on-delete cascade. <i>AC</i> ----- 2 4 3 4 4 5 5 3 7 3 9 5 6 4 1 7	02
1.9	The set of all tuples that must be additionally deleted to preserve referential integrity when the tuple (3,4) is deleted is : Represent Aggregation function and GroupBy clause in relational algebra.	02
1.10	An attribute of relational schema <i>R</i> is called a _____ if it is a member of some candidate key <i>R</i> .	01

1.11	The main problem associated with the recoverable schedule is _____.	
1.12	_____ is a transaction property ensured by the concurrency control subsystem.	01 01

PART-B

2	a	Justify how three-schema architecture provides logical and physical data independence with a neat diagram. Which is harder to achieve? Illustrate the main phases of database design with respect to University Database. Distinguish between cardinality ratio and participation constraints with example.	06 06 04
3	a	Consider the following requirements for a simple database for the National Hockey League (<i>NHL</i>): <ul style="list-style-type: none"> the <i>NHL</i> has many teams, each team has a name, a city, a coach, a captain and a set of players, each player belongs to only one team, each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records, a team captain is also a player, a game is played between two teams (referred to as <i>host_team</i> and <i>guest_team</i>) and has a date (such as <i>May 11th, 1999</i>) and a score (such as 4 to 2). Construct a clean and concise <i>ER</i> diagram for the <i>NHL</i> database. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your <i>ER</i> diagram. b Design a Relational Schema for the given <i>ER</i> diagram.	08
b	c	<p>The ER diagram illustrates the following entities and their relationships:</p> <ul style="list-style-type: none"> Lot: Represented by a rectangle. It has a relationship named "Includes" with Production Units, indicated by a diamond with "1" on the Lot side and "n" on the Production Units side. It also has a relationship named "Created From" with Raw Materials, indicated by a diamond with "n" on the Lot side and "m" on the Raw Materials side. Production Units: Represented by a rectangle. It has a relationship with Lot named "Includes". It also has a relationship with Raw Materials named "Created From". Additionally, it has attributes: serial#, exactWeight, ProductType, ProductDesc, and qualityTest?. Raw Materials: Represented by a rectangle. It has a relationship with Lot named "Created From". It also has attributes: type, material-ID, and UnitCost. Cost-Of-Materials: Represented by an oval. It has a relationship with Lot named "Includes". 	04 04

OR

4	a	<p>For the following Database schema, write the Relational Algebra Queries.</p> <p><i>author(author_id; first_name; last_name)</i> <i>author_pub(author_id; pub_id; author_position)</i> <i>book(book_id; book_title; month; year; editor)</i> <i>pub(pub_id; title; book_id)</i></p> <p>Assume editor in book is a foreign key referencing author (author_id)</p> <ul style="list-style-type: none"> i) List the names of all authors who are not book editors ii) List the names of all authors who are book editors iii) List the names of all authors who have at least one publication in the database. iv) List the author_id authored a pub that was published in July 	08
	b	<p>Consider the following requirements of 'UPS Pride' company which keeps up-to-date information on the processing and current location of each Shipped item. Shipped items are the heart of the <i>UPS</i> product tracking information system. Shipped items are characterized by item number (unique), weight, dimensions, insurance amount, destination, and final delivery date. Shipped items are received into the <i>UPS</i> system at a single retail center. Retail centers are characterized by their type, uniqueID and address. Shipped items make their way to their destination via one or more standard <i>UPS</i> transportation events (i.e., flights, truck deliveries). These transportation events are characterized by a unique scheduleNumber, a type (e.g., flight, truck) and a driveRoute. Construct a clean and concise <i>ER</i> diagram for the given database. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your <i>ER</i> diagram.</p>	08
5	a	<p>For the following Database schema, write the <i>SQL</i> Queries.</p> <p><i>Sailors (sid: integer, sname: string, rating: integer, age: real);</i> <i>Boats (bid: integer, bname: string, color: string);</i> <i>Reserves (sid: integer, bid: integer, day: date).</i></p> <ul style="list-style-type: none"> i) Find all information of sailors who have reserved boat number 101. ii) Find the names of sailors who have reserved a red boat, and list in the order of age. iii) Find the ids of sailors who have reserved a red boat or a green boat. iv) Find the name and the age of the youngest sailor. 	08
	b	<p>Consider two sets of <i>FDs</i>, <i>F</i> and <i>G</i>, <i>F</i> = {<i>A</i> → <i>B</i>, <i>B</i> → <i>C</i>, <i>AC</i> → <i>D</i>} and <i>G</i> = {<i>A</i> → <i>B</i>, <i>B</i> → <i>C</i>, <i>A</i> → <i>D</i>}. Are <i>F</i> and <i>G</i> equivalent?</p>	04
	c	<p>Discuss Project Join Normal form (<i>PJNF</i>) with an example.</p>	04
		OR	
6	a	<p>Compare and contrast <i>IN</i> and <i>EXISTS</i> operators by writing nested queries with respect to following schema.</p> <p><i>Sailors (sid: integer, sname: string, rating: integer, age: real);</i> <i>Boats (bid: integer, bname: string, color: string);</i> <i>Reserves (sid: integer, bid: integer, day: date).</i></p>	

- i) Find the names of the sailors who have reserved the boat number 103.
- ii) Find sid's of sailors who've reserved both a red and a green boat
- b Let $R = ABCDE, R1 = AD, R2 = AB, R3 = BE, R4 = CDE$ and $R5 = AE$. Let the functional dependencies be: $A \rightarrow C, B \rightarrow C, C \rightarrow D, DE \rightarrow C, CE \rightarrow A$. Verify whether the given decomposition of R into $\{R1, R2, R3, R4, R5\}$ is lossless join decomposition or not.
- c Let $R = (A, B, C, D, E, F)$ be a relation. The set of functional dependency on R is given as follows: $AB \rightarrow C, A \rightarrow D, E \rightarrow F, B \rightarrow EF$. Determine the key for R and decompose R into 3NF.

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7 a Using MongoDB design a Employee database and write the following queries:

- i) Create Personal database and collection Employees (Empld, Name, Age, Salary, Designation, Address)
- ii) Insert Minimum three documents into the collection
- iii) List all the employees having Salary $>= 8000$ and salary $<= 15000$.
- iv) Sort the documents in Employee collection in ascending order of their names and descending order of their Age
- v) List the Empld, names and salary of all the employees who are managers.

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b Define Tokenizer and Index in Elastic search.

c Differentiate between horizontal and vertical scaling. How MongoDB makes horizontal scaling manageable?

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8 a Consider the three transactions $T1, T2$ and $T3$ and two schedules $S1$ and $S2$. Verify whether the schedules are serializable or not. Write down the equivalent serial schedule for the serializable schedule.

$T1: r1(x), r1(z), w1(x)$

$T2: r2(z), r2(y), w2(z), w2(y)$

$T3: r3(x), r3(y), w3(y)$

$S1: r1(x), r2(z), r1(z), r3(x), r3(y), w1(x), w3(y), r2(y), w2(z), w2(y)$

$S2: r1(x), r2(z), r3(x), r1(z), r2(y), r3(y), w1(x), w2(z), w3(y), w2(y)$

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b Define Lock. Describe the types of lock used in concurrency control.

c Is deadlock possible in 2-phase locking protocol? Justify your answer with an example.

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
VI Semester B. E. Examinations May/June-14
Computer Science and Engineering
DATABASE MANAGEMENT SYSTEMS

Time: 03 Hours

Maximum Marks: 100

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in the first three pages of the answer book only.
2. Answer FIVE full questions from Part B.

PART-A

1.1	What are the implicit properties of a database? (any two properties)	02
1.2	Database management system is a general purpose software system that facilitates the processing of _____, _____, _____ and _____ database among various users and applications.	02
1.3	What is the difference between controlled and uncontrolled redundancy?	02
1.4	What is the difference between a database schema and database state?	02
1.5	What is the difference between a key and a superkey?	02
1.6	Mention two pattern matching symbols used in SQL.	02
1.7	How are SQL statements used within a host language?	02
1.8	What are the uses of functional dependencies?	02
1.9	Define third normal form.	02
1.10	When are two schedules conflict equivalent?	01
1.11	What is the LSN of a log record?	01

PART-B

2 a	A BANK wants to keep track of different types of ACCOUNTS (SAVINGS_ACCTS, CHECKING_ACCTS, ...) and LOANS (CAR_LOANS, HOME_LOANS, ...). Suppose it is also desirable to keep track of each account's TRANSACTIONS (deposits, withdrawals, checks, ...) and each loan's PAYMENTS; both of these include the amount, date, time, Draw the EER diagram concepts of specialization and generalization. State any assumptions you make about the additional requirements.	08
	b What are the advantages of DBMS? Explain.	08
3 a	OR	
	Construct an ER diagram (including important attributes) for a car insurance database that includes data about customers (car owners), cars and accidents, drivers involved in accidents and injured drivers and/or passengers. Note that any customer can insure many cars, each car may have different drivers at different times and accidents typically involve one or more cars. Draw the schema for the same.	10
b	What are the two constraints applied to a specialization? Discuss their usage.	06

4	<p>a Discuss the entity integrity and referential integrity constraints. Why is each considered important?</p> <p>b Generate the relational algebra for the following queries considering the following tables of a database:</p> <p><i>Hotel (hotelNO, hotelName, city)</i></p> <p><i>Room (roomNo, hotelNO, type, price)</i></p> <p><i>Booking (hotelNo, guestNO, dateFrom, dateTo, roomNo)</i></p> <p><i>Guest (guestNo, guestName, guestAddress)</i></p> <ul style="list-style-type: none"> i) List all single rooms with a price below Rs. 2000 per night; ii) List the names and address of all guests; iii) List the price and type of all rooms at the Grosvernor Hotel; iv) List all guests currently staying at the Grosvernor Hostel; v) List all hotels.
OR	
5	<p>a What are insertion, deletion and modification anomalies? Why are they considered bad? Illustrate with examples.</p> <p>b Consider a relation $R(A, B, C, D, E)$ with $F = \{A \rightarrow B, BC \rightarrow E, ED \rightarrow A\}$</p> <ul style="list-style-type: none"> i) List all keys for R; ii) Is R in 3NF?; iii) Is R in BCNF?.
6	<p>a Why is it not straight forward to integrate SQL queries with a host programming language?</p> <p>b How are variables declared in Embedded SQL?</p> <p>c Consider the following schema for a LIBRARY database:</p> <p><i>BOOK (Book_id, Title, Publisher_name)</i></p> <p><i>BOOK_AUTHORS (Book_id, Author_name)</i></p> <p><i>PUBLISHER (Name, Address, Phone)</i></p> <p><i>BOOK_COPIES (Book_id, Branch_id, No_of_copies)</i></p> <p><i>BOOK_LOANS (Book_id, Branch_id, Card_no, Date_out, Due_date)</i></p> <p><i>LIBRARY_BRANCH (Book_id, Branch_Name, Address)</i></p> <p><i>BORROWER (Card_no, Name, Address, Phone)</i></p> <p>Write SQL queries for the following:</p> <ul style="list-style-type: none"> i) How many copies of the book titled The Lost Tribe are owned by the library branch whose name is "Sharpstown"? ii) How many copies of the book titled The Lost Tribe are owned by each library branch? iii) Retrieve the names of all borrowers who do not have any books checked out. iv) For each book that is loaned out from the "Sharpstown" branch and whose DueDate is today, retrieve the book title, the borrower's name, and the borrower's address. v) For each library branch, retrieve branch name and the total number of books loaned out from that branch.
OR	
7	<p>a What are nested queries? What is correlation in nested queries?</p> <p>b How are the operators <i>IN, EXISTS, UNIQUE, ANY</i> and <i>ALL</i> used in writing nested queries? Write queries for each with an example.</p> <p>c How is <i>JDBC</i> driver loaded in Java Code? Give an example.</p>

8	a b c	What are the <i>ACID</i> properties? Illustrate them with example. What is a lock? Describe the types of locks used in concurrency control. How does a schedule end up in deadlock? Illustrate with an example.	10 03 03
OR			
9	a	Consider the three transactions T_1, T_2 and T_3 and the schedules S_1 and S_2 given below. Draw the serializability (precedence) graphs for S_1 and S_2 and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s). $T_1: r_1(X); r_1(Z); w_1(X);$ $T_2: r_2(Z); r_2(Y); w_2(Z); w_2(Y);$ $T_3: r_3(X); r_3(Y); w_3(Y);$ $S_1: r_1(X); r_2(Z); r_1(Z); r_3(X); r_3(Y); w_1(X); w_3(Y); r_2(Y); w_2(Z); w_2(Y);$ $S_2: r_1(X); r_2(Z); r_3(X); r_1(Z); r_2(Y); r_3(Y); w_1(X); w_2(Z); w_3(Y); w_2(Y);$	10
	b	Describe the three steps in crash recovery in <i>ARIES</i> .	06
10	a b c	What is the main idea behind discretionary access control and mandatory access control? What are the relative merits of these two approaches? Explain. Discuss how time is represented in temporal databases and compare the different time dimensions. How do spatial databases differ from regular databases? Discuss the different categories of spatial queries.	08 04 04
OR			
11	a b	Briefly explain the control measures that are used to provide security of data in databases. Explain, with examples, the different triggered actions that occur before, after or concurrently with the triggering event.	08 08

R. V. COLLEGE OF ENGINEERING

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V Semester B. E. Examinations Nov/Dec-18

Computer Science and Engineering**DATABASE DESIGN****Time: 03 Hours****Maximum Marks: 100****Instructions to candidates:**

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
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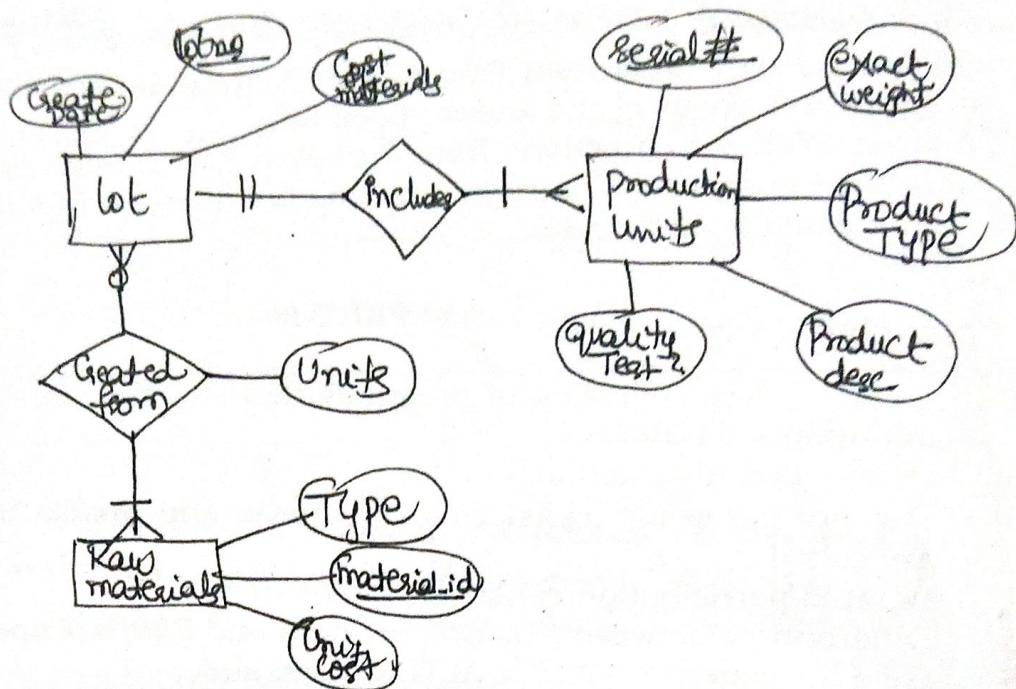
PART-A

1	1.1	_____ is a collection of programs that enables users to create and maintain a database.	01
	1.2	Define data abstraction.	01
	1.3	The processes for transforming requests and results between levels are called _____.	01
	1.4	What is participation constraint?	01
	1.5	Differentiate between <i>SELECT</i> operation and <i>PROJECT</i> operation.	02
	1.6	Give the general syntax of <i>ALTER</i> command.	02
	1.7	Mention the function of <i>EXISTS</i> in <i>SQL</i> .	01
	1.8	_____ is a constraint between 2 sets of attributes from the database.	01
	1.9	When do you say that any two sets of functional dependency are equivalent?	01
	1.10	give any two conditions for satisfying a set of functional dependencies to be minimal.	02
	1.11	State Boyce – Codd Normal Form (<i>BCNF</i>).	01
	1.12	When do you say schedule is said to be cascadeless?	01
	1.13	A binary lock can have _____ and _____ states.	02
	1.14	_____ is a name of a field or property.	01
	1.15	Elastic search uses _____ as the serialization format for documents.	01
	1.16	_____ is specified using a <i>JSON</i> request body.	01

PART-B

a	Mention the important characteristics of the database approach versus the file processing approach. Explain any two with suitable examples.	08
b	Sketch with a neat diagram, the database system environment by clearly mentioning the <i>DBMS</i> component modules. Explain in brief.	08
a	List and explain the various characteristics of the relations used in Relational Data Model.	07

- b Consider the following ER diagram for the manufacturing environments used for tracking of production. It shows relationship between production lots, individual production units and raw materials.
- Convert the ER diagram into a relational database schema. Indicate primary keys and referential integrity.
 - Identify an attribute in the ER diagram that represents a composite attribute and explain how.



OR

- 4 a Summarize the different *JOIN* operations used in the relational algebra with appropriate examples for each.
b Consider the following relation schema:
 $\text{employee}(\text{employee_name}, \text{street}, \text{city})$
 $\text{works}(\text{employee_name}, \text{company_name}, \text{salary})$
 $\text{company}(\text{company_name}, \text{city})$
 $\text{manager}(\text{employee_name}, \text{manager_name})$
 Give an expression in SQL for each of following queries:
- Find the names, street address and cities of residence for all employees who work for "First Bank Corp" and earn more than Rs 10,000
 - Find the names of all employees in the database who live in the same cities as companies for which they work
 - Find the names of all employees in the database who do not work for "First Bank Corp". Assume that all people work for exactly one company.
 - Find the name of the company that has the smallest payroll. Assume that the companies may be located in several cities.
 - Find all companies located in every city in which "Small Bank Corporation" is located.

- 5 a Compare and contrast between Nested Queries and Correlated Nested Queries. Give relevant examples for each.

b	<p>Consider the following relations R_1 and R_2 and the respective functional dependencies</p> <p>$R_1 = (A_1, B_1, C_1, D_1)$</p> <p>$A_1 B_1 \rightarrow C_1, C_1 \rightarrow D_1$ and $D_1 \rightarrow A_1$</p> <p>and $R_2 = (A_2, B_2, C_2, D_2)$</p> <p>$A_2 \rightarrow B_2, B_2 \rightarrow C_2, C_2 \rightarrow D_2$ and $D_2 \rightarrow A_2$</p> <p>i) List all the candidate keys of R_1 and R_2 ii) What is the highest normal form of R_1 and R_2? Explain how?</p>	08
	OR	
a	With the help of an appropriate example, describe the second Normal Form and Third Normal Form.	08
b	Give the Formal definition of Multivalued dependency. List and explain in brief the various inference rules for functional and multivalued dependencies.	08
a	Mention and explain in brief the different command line tools in MongoDB.	08
b	Define document. Explain Document Metadata, retrieving a document with example.	08
a	Define Timestamp in concurrency control. Write and explain the timestamp ordering algorithm.	07
b	State and explain the ARIES Recovery algorithm with an example.	09