15. (a) State the properties of columnar databases and discuss in detail about MongoDB data model with suitable examples.

Or

(b) Elucidate about Hbase data model with a suitable sketch.

PART C — (1 × 15 = 15 marks)

16. (a) Consider the following relations.

borrower(customer Name loan No) depositor(customerName,accountNo) customer(customerName,custStreet,custcity) account(account_No,balance) loan(loanNumber,branchName, amount)

Follow the steps of the heuristic query optimization algorithm and represent the query tree according to each step and conclude with the optimized query tree.

Or

(b) Explain in detail about the various types of UML diagrams with a neat sketch. Also, mention their purpose with a suitable example.

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Question Paper Code : 20047

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Fourth Semester

Artificial Intelligence and Data Science

AD 8401 – DATABASE DESIGN AND MANAGEMENT

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the responsibility of Transaction manager.

2. Define instance and schema?

3. Distinguish between join and conditional join.

4. Write the general syntax of TRC queries.

5. Illustrate functional dependency with suitable example.

6. Mention multivalued dependency.

7. Give the comparison between serial Schedule and parallel schedule with example.

8. List the Four Properties of Transactions.

9. What is meant by an object-oriented data model?

10. Differentiate Relational databases with columnar databases.

PART B — (5 × 13 = 65 marks)

11. (a) Although you always wanted to be an artist, you ended up being an expert on databases. Your old love is still there, however, so you set up a database company, Art Base that builds a product for art galleries. The core of this product is a database with a schema that captures all the information that galleries need to maintain. Galleries keep information

about artists, their names (which are unique), birthplaces, age, and style of art. For each piece of artwork, the artist, the year it was made, its unique title, its type of art (e.g., painting, lithograph, sculpture, photograph), and its price must be stored. Pieces of artwork are also classified into various kinds, for example, portraits, still lifes, works by Picasso, or works of the 19th century; a given piece may belong to more than one group. Each group is identified by a name (like those just given) that describes the group. Finally, galleries keep information about customers. For each customer, galleries keep that person's unique name, address, the total amount of dollars spent in the gallery (very important!), and the artists and groups of art that the customer tends to like.

Draw the ER diagram for the given scenario.

Or

(b) Discuss in detail about the components of a Database System with a suitable diagram.

12. (a) Consider a database with the following schema.

(i) Write down the strong and weak entity sets

    (1) Person (name, age, gender)

    (2) Frequents (name, pizzeria)

    (3) Eats (name, pizza)

    (4) Serves (pizzeria, pizza, price)

(ii) Write relational algebra expressions for the following queries.

    (1) Find the names of all females who eat either mushroom or pepperoni pizza (or both). (3)

    (2) Find the names of all people who frequent only pizzerias serving at least one pizza they eat. (3)

    (3) Find the pizzeria serving the cheapest pepperoni pizza. In the case of ties, return all of the cheapest-pepperoni pizzerias. (3)

    (4) Find the total count of people taking a specific pizza for each pizzeria. (3)

Or

(b) How do you apply one constraint across multiple columns and multiple constraints on the same column? Illustrate with suitable example in SQL.

13. (a) Consider the health history report table given below and normalize it to 3NF.

Pet Id	Pet Name	Pet Type	Pet Age	Owner	Visit Date	procedure Number	procedure Name
24	Rover	Dog	12	Same Cock	Jan 13/17	01	Rabies vaccination
					Mar 27/17	10	Examine and Treat Wound
					Apr 02/17	05	Heart Worm lest
29	spot	Dog	2	Terry Kim	Jan 21/17	08	Tetanus Vaccination
					Mar 10/17	05	Heart Worm Test
34	Moris	Cat	4	Sam Cook	Jan 23/17	01	Rabies Vaccination
					Jan 13/17	01	Rabies Vaccination
51	Twed	Bird	2	Terry Kim	Apr 30/17	20	Annual Check up
					Apr 30/17	12	Eye Wash

Or

(b) (i) Derive the proof for the following inference rules using Armstrong's axiom.

$$\{X \rightarrow Y, XY \rightarrow Z\} \models \{X \rightarrow Z\}$$
$$\{X \rightarrow Y, Z \rightarrow W\} \models \{XZ \rightarrow YW\}$$
$$\{X \rightarrow YZ, Z \rightarrow W\} = \{X \rightarrow W\}$$

(ii) A relation R(A,B,C,D,E,H) has the following functional dependencies

Find the keys and determine the highest normal form satisfied by the relation.

14. (a) Describe in detail about variations of the two-phase locking protocol? Why strict two-phase locking often preferred?

Or

(b) How serializability is enforced by ordering transactions based on their timestamps? Explain elaborately.