Question Paper

Exam Date & Time: 31-May-2023 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal School of Information Sciences (MSIS), Manipal
Second Semester Master of Engineering - ME (Big Data Analytics) Degree Examination - May 2023

Modern Databases for Big Data [BDA 5202]

Marks: 100 **Duration: 180 mins.**

Wednesday, May 31, 2023

Answer all the questions.

1) Q1. (CO1, L3) (10)

A. What is relational database management system? (1 Mark).
B. A relational database is to be designed for a medium sized Company dealing with industrial applications of computers. The Company delivers various products to its customers ranging from a single application program through to complete installation of hardware with customized software. The Company employs various experts, consultants and supporting staff. All personnel are employed on long- term basis, i.e. there is no short-term or temporary staff. Although the Company is somehow structured for administrative purposes (that is, it is divided into departments headed by department managers) all projects are carried out in an interdisciplinary way. For each project a project team is selected, grouping employees from different departments, and a Project Manager (also an employee of the Company) is appointed who is entirely and exclusively responsible for the control of the project, quite independently of the Company's hierarchy.

The following is a brief statement of some facts and policies adopted by the Company.
• Each employee works in some department
• An employee may possess a number of skills
• Every manager (including the MD) is an employee
• A department may participate in none/one/many projects.
• At least one department participates in a project.
• An employee may be engaged in none/one/many projects
• Project teams consist of at least one member.

For the above case study identify the Entities, Attributes and relationships (3x3= 9 marks)

2) Q2. (CO1, L4) (10)

For the Question 1 draw the E-R diagram clearly stating the cardinality relationship between the entities and highlighting the primary and foreign

relationship between the entities and highlighting the primary and foreign key.

3) Q3. (CO1, L2) (2.5+2.5+5 = 10 marks) (10)
What are ACID Properties? What is specialization and generalization? Explain 1NF and 2 NF with an example.

4) Q4. (CO1, L4) (2.5 x 4 = 10 Marks) (10)

Consider the following tables:

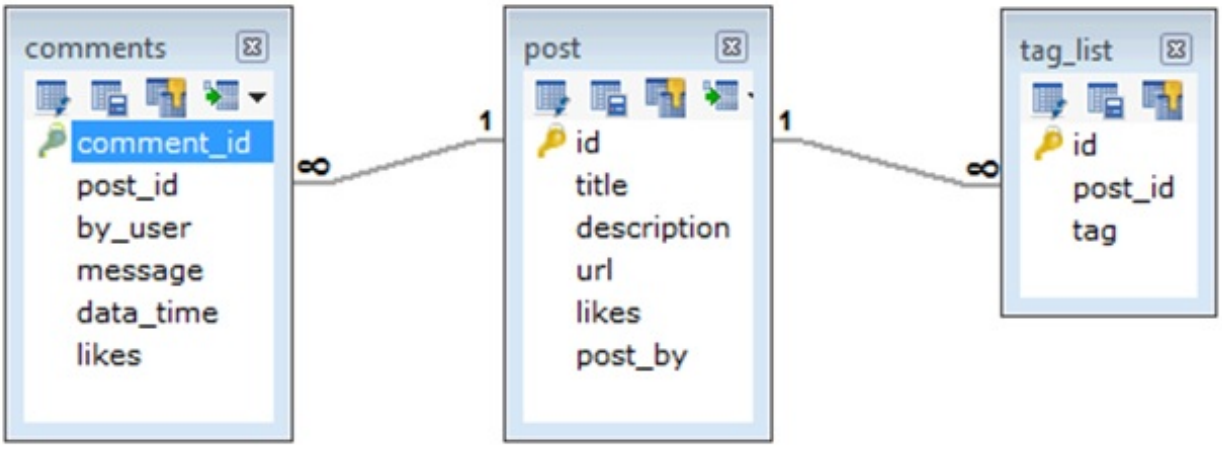
Department: dept_id (PK), dept_name, dept_location
Employee: emp_id (PK), emp_name, emp_salary, emp_age, emp_date_of_joining, emp_designation, dept_id (FK), Employement_type (permanent/ contract)
Project: project_id (PK), project_name, project_budget, project_status (active/ completed/discarded), depart_id(FK)
Employee_Project_Mapping (Table helps to identify which employee is working on a given project): project_id (FK), emp_id(FK).

Write SQL queries on the above tables:
1. Display the employee ID, employee name and department name who works as a contract employee .
2. Count number of permanent employees working in each department
3. Display how many employees are working on each project that are active.
4. Display the details of the project as per maximum budget allocated

5) (CO2, L2) (10)
How do you classify different types of data? Explain different types of NoSQL databases with an example each.

6) Q6. (CO2, L2) (2+4+4 = 10 marks) (10)
What are fully managed DB? What are advantaged of fully managed DB. How do aws dynamoDB ensures high availability?

7) Q7. CO2, L3) (10)
Convert the given relational database to document database (Write json document). 10 marks



8) (CO3, L2) (2+1+2+5 = 10 marks) (10)

A. Mention which noSql database is suitable for the following example. (Just mention the type, no explanation required:
1. To store and update various web page metrics and counter

2. Content management of web pages
3. Social networks such as Facebook and LinkedIn
4. Using a web session ID as the key, the value contains everything that was captured during the session.

B. What is MongoDB? What are its features? Explain CRUD operations of MongoDB

9) Q9. (CO3, L3) (10)

Given "orders" collection of document DB, Perform the following operations

A. Delete record where quantity is greater than 25
B. Display entries of order collection name="Cheese" and "Vegan"
C. Display name and size of the pizza where price is lesser than 15
D. Display name, size, quantity of the pizza where total quantity is greater than 10
E. Display total quantity sold in small, medium and large pizza.

```
db.orders.insertMany( [
{ _id: 0, name: "Pepperoni", size: "small", price: 19,
quantity: 10, date: ISODate( "2021-03-13T08:14:30Z" ) },
{ _id: 1, name: "Pepperoni", size: "medium", price: 20,
quantity: 20, date : ISODate( "2021-03-13T09:13:24Z" ) },
{ _id: 2, name: "Pepperoni", size: "large", price: 21,
quantity: 30, date : ISODate( "2021-03-17T09:22:12Z" ) },
{ _id: 3, name: "Cheese", size: "small", price: 12,
quantity: 15, date : ISODate( "2021-03-13T11:21:39.736Z" ) },
{ _id: 4, name: "Cheese", size: "medium", price: 13,
quantity:50, date : ISODate( "2022-01-12T21:23:13.331Z" ) },
{ _id: 5, name: "Cheese", size: "large", price: 14,
quantity: 10, date : ISODate( "2022-01-12T05:08:13Z" ) },
{ _id: 6, name: "Vegan", size: "small", price: 17,
quantity: 10, date : ISODate( "2021-01-13T05:08:13Z" ) },
{ _id: 7, name: "Vegan", size: "medium", price: 18,
quantity: 10, date : ISODate( "2021-01-13T05:10:13Z" ) }
] )
```

10) Q10. (CO3, L2) (10)

What is aggregation? Explain any 4 stages of aggregation pipeline with an example each.

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