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Question Paper Code : 70006

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Third Semester

Artificial Intelligence and Data Science

AD 3391 — DATABASE DESIGN AND MANAGEMENT

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the concept of specialization in ER diagram.
2. What is sequence diagram? and why do we use it?
3. Define the terms relation schema.
4. Why null values might be introduced into the database.
5. What is partial functional dependencies? Give example
6. What is the lossless join property of decomposition? Why is it important?
7. What is a transaction?
8. Why must lock and unlock be atomic operations?
9. What are the two kinds of new data types supported in object-database systems?
10. When to use SQL and NOSQL?

PART B — (5 × 13 = 65 marks)

11. (a) State and explain the database system development life cycle with an example.

Or

- (b) Explain the following terms briefly in E-R model: attribute, domain, entity, relationship, entity set, relationship set, one-to-many relationship, many-to-many relationship, participation constraint, overlap constraint, covering constraint, weak entity set, aggregation, and role indicator.

12. (a) (i) Describe the four clauses in the syntax of a simple SQL retrieval query. Show what type of constructs can be specified in each of the clauses. Which are required and which are optional? (7)
- (ii) State the need for triggers. When to use triggers and when not to use triggers? Explain with example. (6)

Or

- (b) Discuss how NULLs are treated in comparison operators in SQL. How are NULLs treated when aggregate functions are applied in an SQL query? How are NULLs treated if they exist in grouping attributes?
13. (a) Discuss the correspondences between the ER model constructs and the relational model constructs. Show how each ER model construct can be mapped to the relational model and discuss any alternative mappings.

Or

- (b) What is the need for normalization? Discuss the various normalization technique used with example.
14. (a) What is the function of locking protocol? State and explain the two-phase locking with example.

Or

- (b) (i) Define these terms: atomicity, consistency, isolation, durability, schedule, blind write, dirty read, unrepeatable read, serializable schedule, recoverable schedule, avoids-cascading-aborts schedule. (7)
- (ii) Compare binary locks to exclusive/shared locks. Why is the latter type of locks preferable? (6)
15. (a) (i) What are collection hierarchies? Give an example that illustrates how collection hierarchies facilitate querying. (7)
- (ii) Discuss how a DBMS exploits encapsulation in implementing support for ADTs (6)

Or

- (b) (i) What are indexes in MongoDB? State and explain different types of index with example. (7)
- (ii) State and explain the Hbase data model and CRUD operations with example. (6)

16. (a) Consider the following relations.

Suppliers (sid:integer sname:string address:string)

Parts(pid:integer pname:string color:string)

Catalog(sid:integer pid:integer cost:real)

Write SQL statement for the following queries

(5 × 3 = 15)

- (i) Construct the E-R Diagram for the schema given.
- (ii) Find the names of suppliers who supply some red part.
- (iii) Find the sids of suppliers who supply some red part or are at No: 1, Anna Salai.
- (iv) Find the pids of parts supplied by at least two different suppliers.
- (v) Find the pids of the most expensive parts supplied by suppliers named sam.

Or

- (b) A car-rental company maintains a database for all vehicles in its current fleet. For all vehicles, it includes the vehicle identification number, license number, manufacturer, model, date of purchase, and color. Special data are included for certain types of vehicles:
- Trucks: cargo capacity.
 - Sports cars: horsepower, renter age requirement.
 - Vans: number of passengers
 - Off-road vehicles: ground clearance, drivetrain (four-or two-wheel drive).

Construct an SQL schema definition for this database. Use inheritance where appropriate.

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Question Paper Code : 30010

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Third Semester

Artificial Intelligence and Data Science

AD 3391 – DATABASE DESIGN AND MANAGEMENT

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is quaternary in UML? Give an example.
2. Compare between Centralized Approach and View Integration Approach in requirement collection.
3. What is a Referential Integrity? Give an example.
4. Why do we need view in SQL?
5. Compare between ER model and EER model.
6. Write a note on BCNF normal form.
7. Define granularity.
8. How serializability is guaranteed by Two – Phase Locking technique?
9. State the CAP theorem in NOSQL.
10. Compare between subtypes and supertypes.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Illustrate in detail about the three levels (external, conceptual, internal) of database architecture. (7)
- (ii) Outline the flow of database system development lifecycle and explain. (6)

Or

- (b) (i) Exemplify in detail about the diagrammatic representation of entity and relationship types in UML. (7)
- (ii) Compare and contrast between specialization and generalization process in Enhanced ER modeling. (6)

12. (a) Describe in detail about the relationship between mathematical relations and relations in the relational data model.

Or

- (b) (i) Explain in detail about SELECT statement in SQL with its general form and examples. (7)
- (ii) Discuss in detail about SQL datatypes with examples. (6)

13. (a) Illustrate in detail about Functional dependencies with relevant examples.

Or

- (b) Exemplify in detail about First, Second and Third Normalization with relevant examples.

14. (a) (i) Sketch the state transition diagram for a database transaction and explain the flow. (7)
- (ii) Describe the ACID properties of transaction processing. (6)

Or

- (b) Discuss in detail about Two Phase Locking and Timestamp based protocols in Concurrency Control.

15. (a) Explain in detail about Object Relational Data Model with diagram.

Or

- (b) Discuss in depth about MongoDB database and its CRUD operations with an example application.

PART C — (1 × 15 = 15 marks)

16. (a) Create an Entity – Relationship diagram for a car dealership. The dealership sells both new and used cars, and it operates a service facility. Base your design on the following business rules:

- A salesperson may sell many cars, but each car is sold by only one salesperson.

- A customer may buy many cars, but each car is bought by only one customer.
- A salesperson writes a single invoice for each car he or she sells.
- A customer gets an invoice for each car he or she buys.
- A customer may come in just to have his or her car serviced; that is, a customer need not buy a car to be classified as a customer.
- When a customer takes one or more cars in for repair or service, one service ticket is written for each car.
- The car dealership maintains a service history for each of the cars serviced. The service records are referenced by the car's serial number.
- A car brought in for service can be worked on by many mechanics, and each mechanic may work on many cars.
- A car that is serviced may or may not need parts (e.g., adjusting a carburetor or cleaning a fuel injector nozzle does not require providing new parts)

Or

- (b) Create the following tables using SQL

Employee (FName, Middle, LName, SSN, BDate, Address, Sex, Salary, SupervisorSSN, DeptNo)

Department (DName, DeptNo, Manager SSN, StartDate)

Write SQL queries to perform the following tasks:

- Find the sum of the salaries of all employees of the 'Accounts' department as well as the maximum salary, the minimum salary, and the average salary in this department.
- Retrieve the name of each employee Controlled by department number 5
- Retrieve the name of each Dept and number of employees working in each department which has at least 2 employees.
- Retrieve the name of employees who born in the year 1990's.
- Retrieve the name of employees and their Dept name.

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Question Paper Code : 20013

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Third Semester

Artificial Intelligence and Data Science

AD 3391 – DATABASE DESIGN AND MANAGEMENT

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the disadvantages of file processing systems?
2. List the applications of DBMS.
3. What are the categories of SQL command?
4. What is a candidate key and primary key?
5. List the desirable properties of decomposition.
6. What is meant by normalization of data?
7. What are the ACID properties?
8. What are the different modes of lock?
9. What are the advantages of NoSQL?
10. Write the advantages of object oriented model.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Design a relational database for a university registrar's office. The office maintains data about each class, including the instructor, the number of students enrolled, the time and place of the class meetings. For each student-class pair, a grade is recorded. (6)
- (ii) Draw an ER-diagram for the above specified relational database for a university registrar's office. (7)

Or

- (b) (i) Explain the 3 schema architecture of DBMS. Why do we need mappings between different schema level? (6)
- (ii) Explain the architecture of DBMS. (7)
12. (a) List and explain various DDL, DML and DCL commands in detail with examples. (13)
- Or
- (b) Explain in brief about Subqueries and Correlated queries. (13)
13. (a) Explain various normal forms in database management systems which are required for fulfilling normalization requirements of an organization. (13)
- Or
- (b) Explain in detail, the Closure of set of functional dependency and Closure of Attribute sets. (13)
14. (a) Explain in detail two-phase locking and how does it guarantee serializability. (13)
- Or
- (b) Discuss the concurrency control mechanism in detail using suitable example. (13)
15. (a) Explain mapping an EER Schema to an ODB Schema in detail. (13)
- Or
- (b) Explain MongoDB-Data Modelling in detail with a real time example. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Consider the following schema :
- Suppliers (sid: integer, sname: string, address: string)
- Parts (pid: integer, pname: string, color: string)
- Catalog (sid: integer, pid: integer, cost: real)
- Write appropriate SQL commands to solve the following queries :
- (i) Find the names of suppliers who supply some red part.
- (ii) Find the sids of suppliers who supply some red or green part.
- (iii) Find the sids of suppliers who supply some red part or are at 221 Packer Street.
- (iv) Find the sids of suppliers who supply some red part and some green part.
- (v) Find the sids of suppliers who supply every part.

Or

- (b) Consider the following Schema :
- Flights (flno: integer, from: string, to: string, distance: integer, departs: time, arrives: time)
- Aircraft (aid: integer, aname: string, cruisingrange: integer)
- Certified (eid: integer, aid: integer)
- Employees (eid: integer, ename: string, salary: integer)
- Write appropriate SQL commands to solve the following queries :
- (i) Find the eids of pilots certified for some Boeing aircraft.
- (ii) Find the names of pilots certified for some Boeing aircraft.
- (iii) Find the aids of all aircraft that can be used on non-stop flights from Bonn to Madras.
- (iv) Identify the flights that can be piloted by every pilot whose salary is more than \$100,000.
- (v) Find the names of pilots who can operate planes with a range greater than 3,000 miles but are not certified on any Boeing aircraft.