

28/6/22 (FN)

Reg. No. :

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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 — ($10 \times 2 = 20$ 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 — ($5 \times 13 = 65$ 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

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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.

$$\{X \rightarrow Y, XY \rightarrow Z\} = \{X \rightarrow Z\}$$

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

$$\{X \rightarrow YZ, Z \rightarrow W\} = \{X \rightarrow W\}$$

- (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.

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.

Reg. No. :

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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)

PART C — (1 × 15 = 15 marks)

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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20/1/2023(FN)

Reg. No. :

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Question Paper Code : 90040

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 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 — ($10 \times 2 = 20$ marks)

1. Who is a DBA? What are the responsibilities of a DBA?
2. State the different phases of the database development Life cycle in DBMS.
3. Differentiate DDL And DML Command In DBMS.
4. Give any four SQL commands used in Data Manipulation Language.
5. What is meant by lossless-join decomposition? Give an example.
6. Differentiate specialization and generalization.
7. State the two types of locks.
8. What are the four conditions of deadlock?
9. Define UDT. Give example.
10. What is the CRUD operation? Where are CRUD operations used?

PART B — ($5 \times 13 = 65$ marks)

11. (a) (i) What is Data Modelling? Discuss types of Data Models in DBMS. (7)
- (ii) Draw an object diagram of an order management system. (6)

Or

- (b) (i) Define the Component of ER Diagram: Entity (Weak), Attribute (Key, Composite, Multivalued, Derived), Relationship (One-to-One, One-to-many, Many-to-many) (7)
- (ii) What is the main difference between the Primary key, Candidate key, Super key, Foreign key, and Artificial key? (6)
12. (a) (i) Discuss types of integrity constraints? (4)
- (ii) Explain any five SQL aggregate function. (4)
- (iii) Given Customers table. Write the SQL command: (5)

customer_id	first_name	last_name	age	country
1	John	Doe	31	USA
2	Robert	Luna	22	USA
3	David	Robinson	22	UK
4	John	Reinhardt	25	UK
5	Betty	Doe	28	UAE

- Select all customers from the Customers table having first_name John.
- Select all customers from the Customers table having an age greater than 25.
- Select all customers from the Customers table having last_name Doe and country USA.

Or

- (b) (i) Discuss different types of data independence. (4)
- (ii) What is the difference between the WHERE clause and the HAVING clause? (4)
- (iii) Write the SQL command: create a table, delete a table, change a table name, delete a row, create a database. (5)
13. (a) (i) What is Normalization? Discuss various types of Normal Forms up to BCNF. (7)
- (ii) Mention the advantages and disadvantages of Normalization. (6)

Or

- (b) (i) What is the Inference Rule (IR)? Discuss six types of IR of Functional Dependency (FD). (7)
- (ii) Find the Trivial, Non-trivial, and complete non-trivial FD. (6)
- $A \rightarrow B$ where B is a subset of A.
 - $A \rightarrow B$ where B is not a subset of A.
 - $A \rightarrow A$ and $B \rightarrow B$
 - $A \rightarrow B$ where $A \cap B = \text{NULL}$.

$ID \rightarrow \text{Name}, \text{Name} \rightarrow \text{DOB}$

14. (a) (i) Explain ACID Properties with examples. (7)
- (ii) Consider the following schedules involving two transactions. Which one of the following statements is true? (6)
- S1: R1(X) R1(Y) R2(X) R2(Y) W2(Y) W1(X)
- S2: R1(X) R2(X) R2(Y) W2(Y) R1(Y) W1(X)
- Both S1 and S2 are conflict serializable
 - Only S1 is conflict serializable \column break
 - Only S2 is conflict serializable
- None

Or

- (b) (i) What is Concurrency in the database? What are the potential problems of Concurrency? (7)
- (ii) Explain the Two-phase locking method and Timestamp-based protocol. (6)
15. (a) (i) What is the difference between SQL and NoSQL databases? (4)
- (ii) Discuss the CAP theorem. (4)
- (iii) Discuss User-defined routines. (5)

Or

- (b) (i) What is the MongoDB model? Explain with an example. (3)
- (ii) Where do we use MongoDB? Who's using MongoDB? (3)
- (iii) What is the difference between RDBMS and MongoDB? (3)
- (iv) Which language is used in MongoDB? (4)

PART C — (1 × 15 = 15 marks)

16. (a) Given a relation R (P, Q, R, S, T, U, V, W, X) and Functional Dependency set (FD). Determine whether the given R is in which normal form.
- (i) $FD = \{PQ \rightarrow R, QS \rightarrow TU, PS \rightarrow VW, \text{ and } P \rightarrow X\}$
 - (ii) $FD = \{PQ \rightarrow R, P \rightarrow ST, Q \rightarrow U, \text{ and } U \rightarrow VW\}$
 - (iii) $FD = \{PQ \rightarrow R, SR \rightarrow PT, T \rightarrow U\}$

Or

- (b) Design the database which manages information about publishers, authors, and books with the following information about the system: .
- Publisher: name and address of the headquarters, set of branches, branch address, branch phone nos. (consider two phone numbers).
- Author: name and address

The book is published by a publisher and has a list of address associated with it. An author can publish several books, but a book is published by at most one publisher.

- (i) Draw an EER diagram for the above specifications. (5)
- (ii) Specify an object-relational database scheme that represents the above properties. (5)
- (iii) Describe the steps for mapping the EER schema to an ODB schema. (5)

7/6/23 FN

Reg. No. :

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Question Paper Code : 30125

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

Fourth Semester

Computer Science and Engineering

CS 3492 – DATABASE MANAGEMENT SYSTEMS

(Common to: Computer and Communication Engineering/Computer Science and Business Systems/Information Technology)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define foreign key with an example.
2. What is data definition language?
3. What is an derived attribute? Give example.
4. What is functional dependency? Give example.
5. Define serializability.
6. Name the four conditions for deadlock.
7. Outline the need for indexing.
8. What is a hash function? Give example.
9. What is a distributed database management system?
10. Define encryption with an example.

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81

PART B — (5 × 13 = 65 marks)

11. (a) Explain the database management system architecture with a neat sketch. (13)

Or

- (b) (i) Outline select and project operations in relational algebra with an example. (5)
- (ii) What is embedded SQL? Explain with an example. (8)
12. (a) Elaborate on first normal form, second normal form and third normal form with examples. (13)

Or

- (b) Explain Boyce Codd normal form, fourth normal form and fifth normal form with examples. (13)
13. (a) (i) What is a transaction? List and explain ACID properties with an example. (6)
- (ii) Outline the two phase locking protocol with an example. (7)

Or

- (b) What is recovery? Outline the steps in the Algorithm for Recovery and Isolation Exploiting Semantics (ARIES) algorithm with an example. (13)
14. (a) (i) Outline B tree index and B+ tree index with an example. (6)
- (ii) Explain static hashing with an example. (7)

Or

- (b) What is query processing? Elaborate about the steps in query processing with a diagram. (13)
15. (a) What is a distributed transaction? Explain distributed query processing with an example. (13)

Or

- (b) (i) What is NoSQL? Outline the features of NoSQL databases. (8)
- (ii) Discuss role based access control with an example. (5)

PART C — (1 × 15 = 15 marks)

Consider the following relations:

EMPLOYEE

ENO	NAME	DOB	GENDER	DCODE
12345	HAMEN	24-MAR-2001	M	201
12346	VINI	12-MAR-2001	F	202
12347	ANI	11-JAN-1999	F	
12348	PETER	14-FEB-2001	M	

DEPARTMENT

DCODE	DNAME
201	COMPUTER SC
202	INFN SC
203	CIVIL
204	MECHANICAL

The primary key of each relation is underlined. Outline Cartesian product, equi join, left outer join, right outer join and full outer join operations in relational algebra. Illustrate the above relational algebra operations with the EMPLOYEE and DEPARTMENT relations.

Or

- (b) A Company is organized into departments. Each department has employees working in it. The attributes of department include department number and department name. The attributes of employee include employee number, employee name, date of birth, gender, date of joining, designation and basic pay. Each department has a manager managing it. There are also supervisors in each department who supervise a set of employees. Each department controls a number of projects. The attributes of project include project code and project name. A project is controlled only by one department. An employee can work in any number of distinct projects on a day. The date an employee worked, in time and out time has to be kept track. The company also keeps track of the dependents of each employee. The attributes of dependent include dependent name, date of birth, gender and relationship with the employee.

- (i) Model an Entity Relationship diagram for the above scenario. (7)
- (ii) Map the Entity Relationship diagram you have modeled to relations. (8)