Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 30109

M.C.A. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Second Semester

(Bridge Course)

BX 4004 — DATABASE MANAGEMENT SYSTEMS

(Regulations 2021)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Compare any two features between file and database systems, expressing the advantages of database over file system.

2. Draw an ER diagram for the following. Also include the cardinality ratio.

   "Sometimes people finance their cars through a bank.

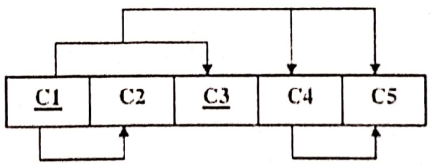
   A car may only be financed by one bank." -

3. Define degree and cardinality of a relation and identify them in the following relation:

Item-no	Item-name	Unit-price	Qty
I1	Pen	20	45
I2	Pencil	3	60
I3	Eraser	2	70

4. Distinguish between drop and delete commands in SQL.

5. What is functional dependency? Given the following dependency diagram (the primary key attributes are underlined), identify the functional dependencies.



6. When is a relation said to be in BCNF?

7. Mention the ACID properties of a transaction.

8. Define check point and its impact on database recovery.

9. List the possible operations on database files.

10. Identify the type of index shown in figure 1 and give a precise note on the same:

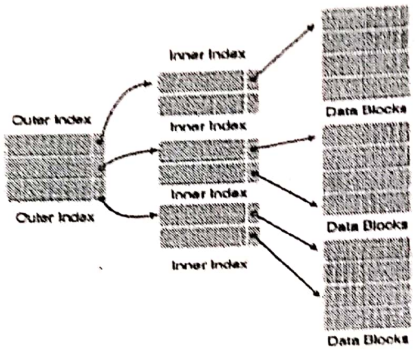


Figure 1

PART B — (5 × 13 = 65 marks)

11. (a) (i) Interpret the type of data model shown in figure 2 for an academic database and justify your choice. Also, mention the features of the identified model. (5)

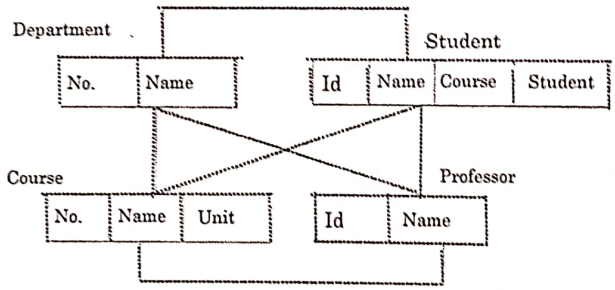


Figure 2

(ii) Define the terms entity, attribute, role and relationship between the entities, giving examples for each of them. Also, for the following problem statement, draw an ER diagram with all structural constraints: "Every student must be a member of a team and one-student might be a team leader". (8)

Or

(b) Define physical and logical data independence. Also, sketch the three level architecture of DBMS and explain the different levels of abstraction. (3+10)

12. (a) (i) Discuss the properties of a table in relational data model. (5)

(ii) Consider the following airline database schema and write Relational Algebra queries for the following questions: (8)

Flight (flno, from, to, distance, departs)

Aircraft (aid, aname, range)

Certified (eid, aid)

Employee (eid, ename, salary)

Pilots are those employees who are certified on at least one aircraft. An aircraft can be used for any flight provided it has sufficient range. Pilots can pilot any flight provided they are certified on an aircraft with sufficient range.

- Find eid's of pilots who are certified on some Boeing.
- Find aid's of aircraft that can fly non-stop from Los Angeles to Chennai.
- Find flno of flights that can be piloted by every pilot whose salary is over Rs.100000.
- Find eid of employee(s) with the highest salary.

Or

(b) (i) How does SQL allow specification of entity and referential integrity constraints? (5)

(ii) Consider the following relations with primary keys underlined and answer the questions below, using SQL:

Salesperson (SNum, Sname, Designation)

Area (ANum, Aname, ManagerNum)

Product (PNum, Pname, Cost)

SoldProd (SNum, ANum, PNum)

- Specify the constraint that the cost of a product cannot be greater than Rs. 10000/-. (2)
- Get the names of all salespersons who are not Managers. (2)
- Create a view SalesCity including the salesperson name and designation of all salespersons who are salesheads, in ascending order of salesperson name. (4)

13. (a) (i) Consider the relation R (A, B, C, D, E) with the set of functional dependencies F = {A, B → C, D → E, A → D}. Consider the decomposition of R into R1 (A, B, C) and R2 (A, D, E). Is the decomposition lossless and dependency preserving? Justify. (5)

(ii) Why is 5NF also called Project Join Normal Form? Describe the fourth and fifth normal forms in normalization, with apt examples. (8)

Or

(b) What do you understand by multi-valued and transitive dependencies? Explain with an example, any two problems that can arise in the database due to these dependencies. (13)

14. (a) (i) Every transaction has certain characteristics attributed to it, which are specified by a SET TRANSACTION statement in SQL. Explain these characteristics, with appropriate examples for each. (6)

(ii) Highlight the importance of validation protocol and explain the phases involved in it. (7)

Or

(b) Compare the features of immediate update, deferred update and shadow paging recovery techniques in transaction processing. (13)

15. (a) (i) Distinguish between primary index and secondary index. (5)

(ii) Why is static hashing deficient? Illustrate the process of bucket overflow and its possible solutions. (8)

Or

(b) Give the node structure of a B+ tree. Construct a B+ tree for the set of key values (6, 16, 26, 36, 46), under the assumption that the number of key values that fit in a node is 3. Apply the insertion algorithm and show the steps involved in the insertions of the given values. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Model the following miniworld of an international wholesale supplier in ER. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your ER diagram. Also, identify the keys and give the functionalities of all relationships:

The wholesale supplier has customers that place orders, which are placed on a particular date and have a total price, current status, and an order number (starting from 1 for each customer). In each order, a customer can order several parts (products), each in a different quantity and at a (possibly discounted) price. Also, model the date on which each of the parts has been sent. The parts are provided by suppliers. Each part may be provided by several suppliers and customers may order the same part of different suppliers in the same order, but in this case, they may have different (retail) prices. Customers and suppliers have a name, an address, a phone number, and a customer/supplier number and they come from a certain nation, which in turn is from a particular region (of the world). Parts have a brand, a size, and a retail price.

Or

(b) Specify the purpose of normalization. Examine the table shown below:

doc-id	doc_name	clinic_id	clinic_location	position	hours_per_week
D105	Ram	C001	Cbe	Dean	16
D105	Ram	C004	Trichy	Dean	9
D112	Shyam	C001	Cbe	Surgeon	14
D112	Shyam	C004	Trichy	Surgeon	10

Why is this table not in 2NF? Describe and illustrate the process of normalizing the data shown in this table to Second Normal Form (2NF). Also identify the primary and foreign keys in the resultant relations.

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