

[This question paper contains 8 printed pages.]

Your Roll No.....

**B**

Sr. No. of Question Paper : 762  
Unique Paper Code : 42341202  
Name of the Paper : Database Management Systems  
Name of the Course : B.Sc. (Prog.) / Math. Science  
Semester : II  
Maximum Marks : 75  
Duration : 3 Hours

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question 1 is compulsory.
3. Answer any five questions out of remaining questions (Q2-Q8).
4. Answer all parts of a question together.

1. Answer the following :

(a) What is data independence? Differentiate between physical and logical data independence. (4)

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- (b) What are the responsibilities of DBA? (2)
- (c) Define the following terms : (2)
- (i) Metadata
- (ii) Derived attribute
- (d) What is meant by a recursive relationship type? Give its example. (2)
- (e) Differentiate between Specialization hierarchy and Specialization lattice. (2)
- (f) What are the various reasons that lead to the occurrence of NULL values in relations? Explain with the help of example. (3)
- (g) Explain the **DROP** command with *cascade* option in SQL with the help of an example. (3)
- (h) What are the various update anomalies that can occur in a relation? (4)
- (i) Given the following table and its associated functional dependencies : (3)

*Emp\_proj*

| <u>Emp_ssn</u> | <u>Project_no</u> | Hours | Emp_name | Proj_name |
|----------------|-------------------|-------|----------|-----------|
|----------------|-------------------|-------|----------|-----------|

$Emp\_ssn \rightarrow Emp\_name$   
 $Project\_no \rightarrow Proj\_name$   
 $Emp\_ssn, Project\_no \rightarrow Hours$

What is the highest normal form that the relation *Emp\_proj* satisfies? Justify your answer.

2. (a) Write any four functionalities of DBMS. (4)
- (b) Differentiate between the following : (6)
- (i) Entity type and Entity set.
  - (ii) Centralized and Distributed DBMS.
  - (iii) Casual End user and Sophisticated end user.
3. Consider a MUSICAL COMPANY database in which data is recorded about the music industry. The data requirements are as follows : (10)
- (i) Each musician has an SSN, a name, an address and a phone number.
  - (ii) Each instrument that is used in the songs has a name and a musical key.
  - (iii) Each album that is recorded on the company label has a title, a copyright date, a format and an album identifier.
  - (iv) Each song recorded at the company has a title and an author.



- (v) Each musician may play several instruments and several musician may play a given instrument.
- (vi) One or more musician perform each song and a musician may perform in a number of songs.
- (vii) Each album has exactly one musician who acts as its producer. A musician may produce several albums.

Design an ER diagram for the above specifications and indicate all keys and cardinality constraints. Also state any assumptions that are made.

4. Consider the following schema about *Supplier - Part* database, primary key is underlined. (10)

*Part* (Partno, Partname, Color, Weight)

*Project* (Pjno, Pjname, City)

*Shipment* (Sno, Partno, Pjno, Qty)

*Supplier* (Sno, Sname, Status, City)

Write SQL commands to express each of the following queries :

- (i) Find the Project number of all the projects using the parts that are supplied by *supplier* 'S1'.

- (ii) Retrieve supplier names for suppliers who supply *part* 'P4'.
- (iii) For each part supplied, retrieve the part number and total quantity supplied for that part.
- (iv) Change the color of *part* 'P6' to red and increase its weight by 7.
- (v) Insert a new tuple into the relation *Project*.
- (a) Describe the three schema architecture. Why do we need mappings between schema levels? (4)
- ✓ (b) Consider the following schema : (6)

**Sailors (Sailor id, Sname, Rating, Age)**

**Boats (Boat id, Bname, Color)**

**Reserves(Sailor id, Boat id, Date)**

Write the following queries in relational algebra:

- (i) Find the names of sailors who have reserved boat 102.
- (ii) Find the names of sailors who have reserved a red or a yellow boat.

- (iii) Find the Sailor\_id of sailors with age over 30 who have not reserved a red boat.

6. (a) Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course : (5)

**Student (Ssn, Name, Major, Bdate)**

**Course (Course#, Cname, Dept)**

**Enroll(Ssn, Course#, Semester, Grade)**

**Book\_Adoption (Course#, Semester, Book\_isbn)**

**Text (Book\_isbn, Book\_title, Publisher, Author)**

Specify the primary keys and foreign keys for this schema, stating any assumptions you make.

- (b) Explain the entity integrity and referential integrity constraints. Why is each considered important?

(5)

7. (a) Consider the relation: R (Dentist no, Appt dt, Appt time, Dentist\_Name, Patient\_no, Patient\_Name, Surgery\_No) with the following FDs : (8)

Dentist\_no, Appt\_dt, Appt\_time → Patient\_no, Patient\_Name



$\text{Dentist\_no} \rightarrow \text{Dentist\_Name}$

$\text{Patient\_no} \rightarrow \text{Patient\_Name, Surgery\_No}$

$\text{Dentist\_no, Appt\_dt} \rightarrow \text{Surgery\_No}$

$\text{Appt\_dt, Appt\_time} \rightarrow \text{Dentist\_no, Dentist\_Name}$

$\text{Patient\_no} \rightarrow \text{Dentist\_Name}$

Decompose the above relation to 3 NF. State the reason behind each decomposition.

(b) Consider the following Table 1.

(2)

Table 1

| X | Y | Z |
|---|---|---|
| 1 | 3 | 8 |
| 3 | 4 | 2 |
| 4 | 5 | 3 |
| 5 | 6 | 4 |
| 6 | 7 | 8 |
| 1 | 3 | 8 |

Which of the following functional dependency constraints do not hold in the Table 1.

(i)  $YZ \rightarrow X$

(ii)  $X \rightarrow Z$

(iii)  $X \rightarrow Y$

(iv)  $Z \rightarrow X$

8. (a) Map the ER diagram given in Figure 1 to a relational database. Cardinality constraints are given as follows :

- (i) BANK and BANK-BRANCH (1 : N)
- (ii) BANK-BRANCH and ACCOUNT (1 : N)
- (iii) BANK-BRANCH and LOAN (1 : N)
- (iv) LOAN and CUSTOMER (M : N)
- (v) ACCOUNT and CUSTOMER (M : N)

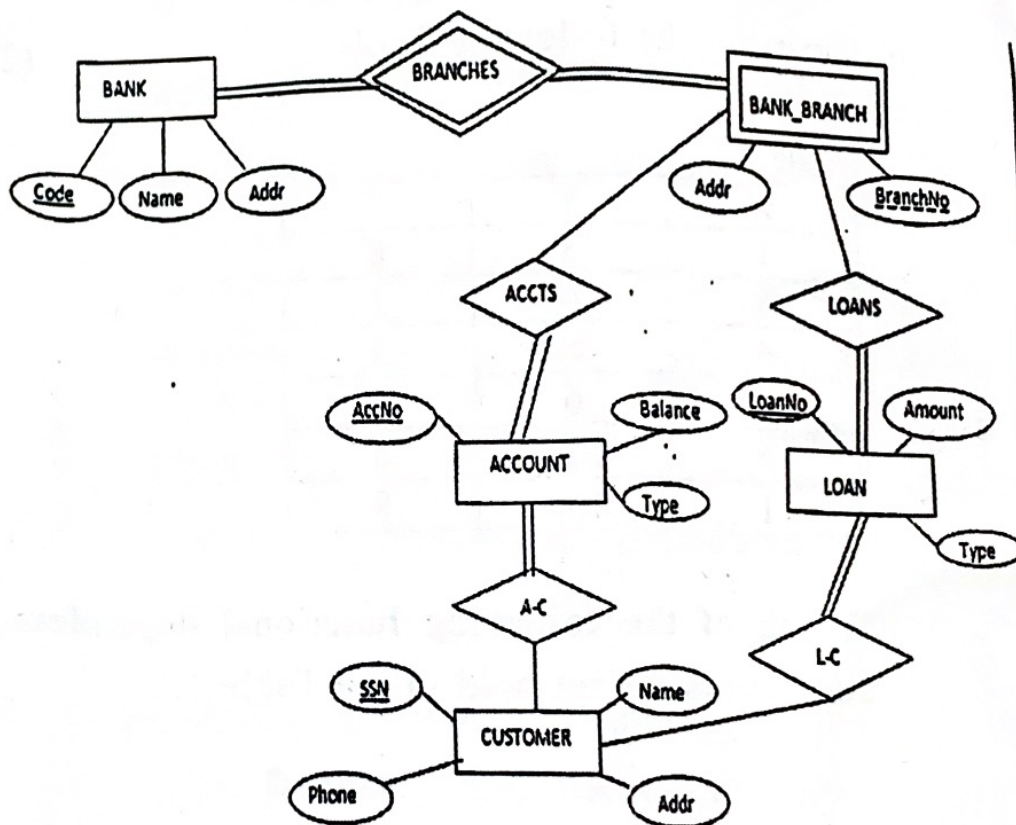


Figure 1

(b) How is EER model different from the ER model?

(2)