CS-2005: Database Systems (CS A,B,C,D,E,F,G,H,J,K)

Wednesday, 3rd April, 2024

Course Instructors

Syed Qaiser Ali Shah, Noor ul Ain, Rabail Zahid, Majid Hussain

Serial No:

Sessional-II Exa

Total Time: 1 Hour

Total Marks: 50

_____

Signature of Invigilator

_____	_____	_____	_____
Student Name	Roll No.	Course Section	Student Signature

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. Attempt on question paper. Read the question carefully, understand the question, and then attempt it. In case of any ambiguity write down your assumption and solve the question.
2. No additional sheet will be provided for rough work.
3. Verify that you have **Ten(10)** different printed pages including this title page. There are **Four(4)** questions.
4. Calculator sharing is strictly prohibited.
5. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.
6. Ensure that you do not have any electronic gadget (like mobile phone, smart watch, etc.) with you.

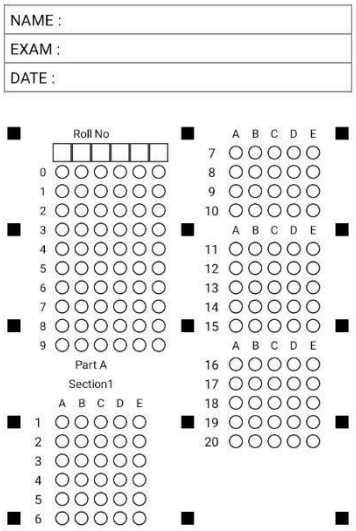
	Q-1	Q-2	Q-3	Q-4	Total
Marks Obtained					
Total Marks	**20**	**10**	**10**	**10**	**50**

Question 1 [20 Marks]

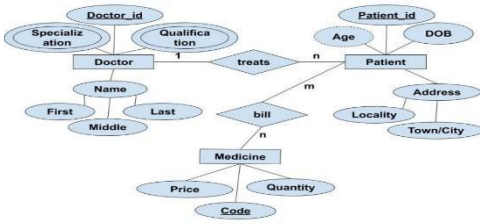
Answer the following twenty multiple choice question in the sheet provided at the end of this question.

1. **c**
2. **c**
3. **c**
4. **c**
5. **c**
6. **c**
7. **b**
8. **e**
9. **c**
10. **d**
11. **d**
12. **b**
13. **c**
14. **b**
15. **a**
16. **c**
17. **c**
18. **d**
19. **a**
20. **b**

Fill the following sheet to answer question 1. Select the correct choice by filling the circle completely.



Question 2 [10 Marks]
Relational Model



Convert the above ERD into a relational model. Provide complete list of tables along with all attributes and constraints. Properly specify all primary and foreign key constraints.

Total Tables: ____6_____

1. **Doctor: <u>Doctor_id</u>, First Name, Middle Name, Last Name [2 Marks]**
2. **Doctor_Qualification: <u>Doctor_id, Qualification</u> Doctor_id references Doctor [1]**
3. **Doctor_Specialization: <u>Doctor_id, Specilization</u> Doctor_id references Doctor [1]**
4. **Patient: <u>Patient ID</u>, DOB, Locality, Town City, Doctor_id Doctor_id references Doctor [2]**
5. **Medicine: <u>Code,</u> Price, Quanity [2]**
6. **Billed: <u>PatientI_D, Code</u> Patient_ID references Patient, Code references Medicine [2]**

Note: -0.5 for not specifying P.K or F.K each

Question 3 [2*5=10 Marks]
SQL

1.

```
SELECT *
FROM customer
WHERE CustomerID NOT IN (
   SELECT CustomerID
```

```
    FROM mobile
    WHERE Cancelled = 'No'
);
```

2.

```
SELECT s.SupervisorID, s.Surname AS SupervisorSurname,
       COUNT(staff.StaffID) AS TotalSupervisedStaff
FROM staff s
LEFT JOIN staff staff ON s.StaffID = staff.SupervisorID
GROUP BY s.SupervisorID, s.Surname;
```

3.

```
SELECT c.Sex AS Gender,
       SUM((c.CallDuration / 60) * p.CallCharge) AS TotalIncome
FROM calls c
INNER JOIN plan p ON c.PlanName = p.PlanName
WHERE YEAR(c.CallDate) = 2019
GROUP BY c.Sex;
```

4.

```
SELECT
    MIN(cust.DOB) AS YoungestDOB,
    MAX(cust.DOB) AS OldestDOB,
    MIN(cust.Surname) AS YoungestSurname,
    MAX(cust.Surname) AS OldestSurname
FROM
    customer cust
JOIN
    mobile m ON cust.MobileID = m.MobileID
WHERE
    m.BrandName = 'iPhone' AND cust.Postcode = '3181';
```

5.

```
SELECT tc.TowerID, t.Location
FROM calls c
JOIN tower_connect tc ON c.ConnectID = tc.ConnectID
JOIN tower t ON tc.TowerID = t.TowerID
WHERE c.CustomerID = 20010
ORDER BY c.CallDate, c.CallTime
```

LIMIT 1;

Note: 2 marks for each correct query

Question 4 [10 Marks]

An owner of a restaurant needs a restaurant management application. That application needs to store data about the company's employees and it starts out by creating the following table of employees.

1. **Analyze the given unnormalized dataset.**
2. **Apply normalization techniques to bring the dataset to Third Normal Form (3NF).**
3. **Provide the normalized tables along with explanations for each normalization step.**

All the entries are atomic and there is a composite primary key (employee_id, job_code) so the table is in the **first normal form (1NF)** **[1 Mark]**.

2nd Normal Form [6 Marks]

EMPLOYEE_ID	NAME	JOB_CODE	JOB	STATE_CODE	HOME_STATE
E001	Alice	J01	Chef	26	Michigan
E001	Alice	J02	Waiter	26	Michigan
E002	Bob	J02	Waiter	56	Wyoming
E002	Bob	J03	Bartender	56	Wyoming
E003	Alice	J01	Chef	56	Wyoming

employee_roles Table

EMPLOYEE_ID	JOB_CODE
E001	J01
E001	J02
E002	J02
E002	J03
E003	J01

employees Table

EMPLOYEE_ID	NAME	STATE_CODE	HOME_STATE
E001	Alice	26	Michigan
E002	Bob	56	Wyoming
E003	Alice	56	Wyoming

jobs table

JOB_CODE	JOB
J01	Chef
J02	Waiter
J03	Bartender

3rd Normal Form: [3 Marks]

employees Table

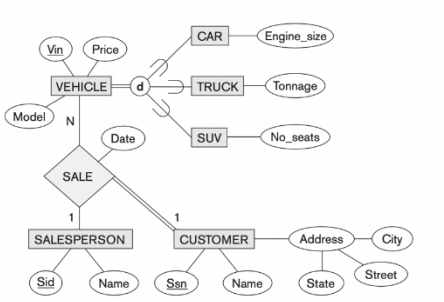
EMPLOYEE_ID	NAME	STATE_CODE
E001	Alice	26
E002	Bob	56
E003	Alice	56

states Table

STATE_CODE	HOME_STATE
26	Michigan
56	Wyoming

Part a:

Consider the given EER diagram and answer the following questions.



a) Map the given EER diagram into relational schema using option "**single relation with one type attribute".**

b) Which of the following is not a full functional dependency?

a. Sid □ Name
b. Vin □ Price, Model
c. Ssn, Name □ City
d. None of the above
e. All of the above

Part b:

f. A library service wants to create a database to store details of its libraries, books

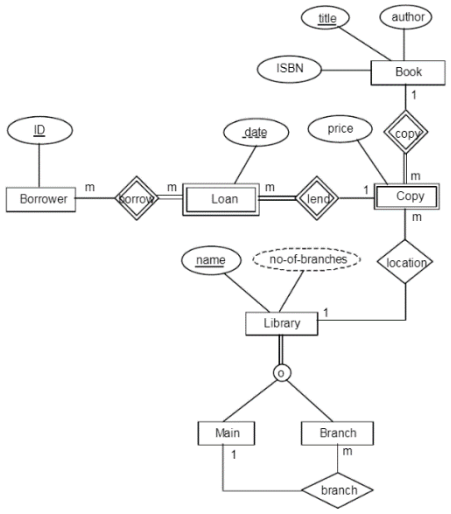
A library service wants to create a database to store details of its libraries, books and borrowers. Details include the following:

A book has a unique ISBN number, a title and one or more authors. The library service may own several copies of a given book, each of which is located in one of the service's libraries. A given library contains many books, and in order to distinguish different copies of the same book a library assigns a different copy-number to each of its copies of a given book; the price that was paid for each copy is also recorded. Every library has a unique name and is either a main library or a branch library. A main library may have zero or more branch libraries and every branch library is a branch of exactly one main library. A borrower has a name and a unique ID code. A borrower can have many books on loan, but each copy of a book can only be on loan to one borrower. A borrower could borrow the same book on several occasions, but it is assumed that each such loan will take place on a different date.

Below diagram illustrates a preliminary design of an Extended-Entity-Relationship model intended to meet the above specifications. The design contains at least 10 errors.
Describe each error, clearly stating both nature of the problem and its solution, and draw a corrected EER model

Figure 2 illustrates a preliminary design of an Extended-Entity-Relationship

model intended to meet the above specification. The design contains at least 10 errors. Describe each error, clearly stating both the nature of the problem and its solution, and draw a corrected EER model.



1. author should be a multivalued attribute.

2. location should be an identifying relationship.
3. Copy should have total participation in location.
4. a Loan can have only 1 Borrower.
5. number should be a discriminating attribute for Copy.
6. Branch should have total participation in the branch relationship.
7. no-of-branches should be an attribute on Main not Library.

8. specialisation of Library should be disjoint.
9. Borrower should have a name attribute.
10. ISBN should be the key of book, not name.

The END