

BSc (General) Degree Second Year
Second Semester Terminal (online) Course Unit Examination
CSC 209 2.0
Database Management Systems

Instructions: CSC209@2020

1. This paper contains 15 MCQs and 4 short answer question.
2. Total time duration is 2 hours.
3. The MCQ contains only a single answer and no negative marks are awarded.
4. When writing answers to the short questions, no need to draw any diagrams or use any special symbols but write your answers using simple English sentences.
5. The questions are presented at random order and only forward navigation is allowed. No backward navigation is facilitated. Therefore, make sure to answer the current question before moving ahead to the next question.
6. At the end of the exam, review the answers one more time and click finish to complete the exam. Do not close the window without clicking on the finish button.

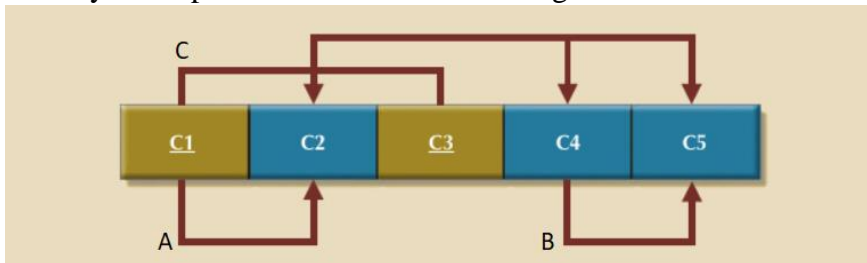
1. An entity set that does not have sufficient attributes to form a primary key is termed a
 - a) strong entity set
 - b) composite entity set
 - c) weak entity set
 - d) derived entity set
2. A rule that cannot be violated by database users is known as
 - a) Referential integrity
 - b) Constraint
 - c) Data independence
 - d) None of the mentioned
3. _____ express the number of entities to which another entity can be associated via a relationship set.
 - a) Mapping Cardinality
 - b) Degree of the relationship
 - c) Participation Constraints
 - d) None of the mentioned
4. An entity in A is associated with at most one entity in B. An entity in B, however, can be associated with any number (zero or more) of entities in A.
 - a) One-to-many
 - b) One-to-one
 - c) Many-to-many
 - d) Many-to-one
5. Database _____ which is the logical design of the database, and the database _____ which is a snapshot of the data in the database at a given instant in time.
 - a) Instance, Schema
 - b) Relation, Schema
 - c) Relation, Domain
 - d) Schema, Instance
6. Data integrity constraints are used to:
 - a) Control who is allowed access to the data
 - b) Ensure that duplicate records are not entered into the table
 - c) Improve the quality of data entered for a specific property
 - d) Prevent users from changing the values stored in the table
7. Which of these is NOT TRUE in case of responsibilities of Database Administrator?
 - i. The setting up the databases, hardware, software, IT infrastructure, etc
 - ii. The establishing of procedures and policies relating to security, maintenance

- iii. Recovery of systems, data, etc, contingency plans, back-up and storage allocations, etc
 - iv. develop views of the database that meet the data and processing
- a) iii and iv
 - b) i, ii and iii
 - c) iii only
 - d) iv only

8. _____ produce the relation that has attributes of R1 and R2.

- a) Cartesian product
- b) Difference
- c) Intersection
- d) Product

9. Identify the dependencies shown in the diagram below.

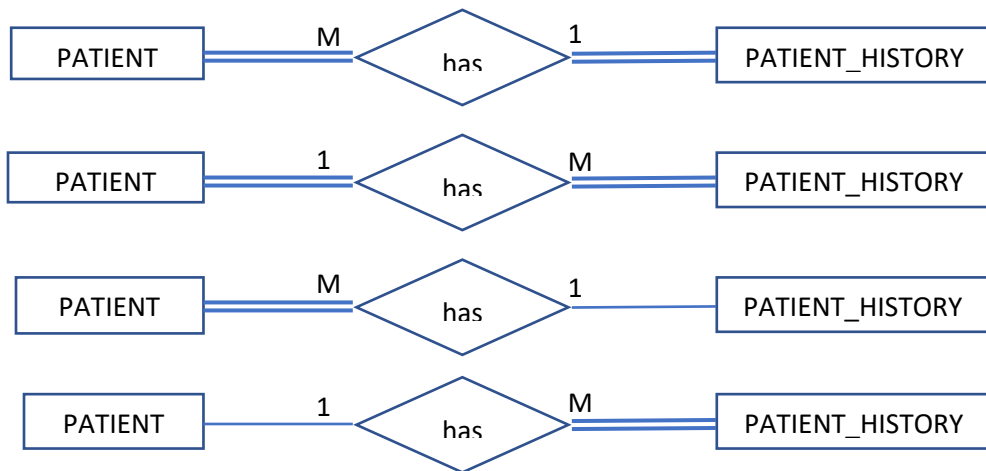


- a) A – Partial, B - transitive, C – Full
 - b) A – transitive, B - transitive, C – Full
 - c) A – Partial, B - Partial, C – Full
 - d) A – transitive, B - Partial, C – Full
10. Which of the following can be addressed by enforcing a referential integrity constraint?
- a) All phone numbers must include the area code
 - b) Certain fields are required (such as the email address, or phone number) before the record is accepted
 - c) Information on the customer must be known before anything can be sold to that customer
 - d) Then entering an order quantity, the user must input a number and not some text (i.e., 12 rather than ‘a dozen’)

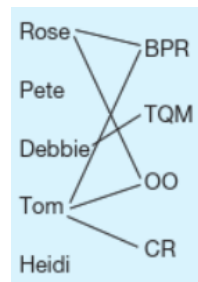
11. Following diagram show the relationship exists between the instances of the PATIENT and PATIENT_HISTORY entity types.



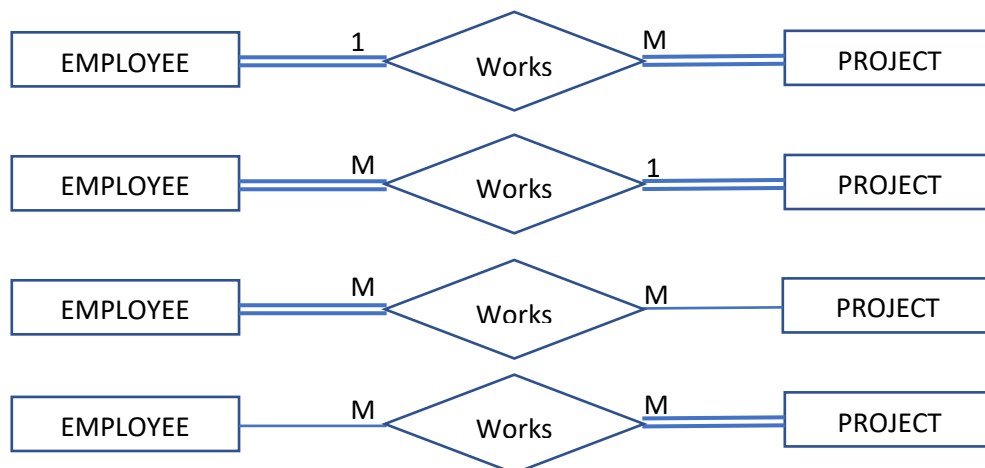
The correct ER notation between the PATIENT and PATIENT_HISTORY entity types is given by



12. Following diagram show the relationship exists between the instances of the EMPLOYEE and PROJECT entity types.



The correct ER notation between the PATIENT and PATIENT_HISTORY entity types is given by



13. An instance of relational schema R(A,B,C) has distinct values of A including NULL values. Which one of the following is true?
- a) A is a candidate key
 - b) A is neither a candidate key nor a primary key
 - c) A is primary key
 - d) A is either a primary key or a candidate key
14. In which of the following, a separate schema is created consisting of that attribute and the primary key of the entity set.
- a) A derived attribute of an entity set
 - b) A multivalued attribute of an entity set
 - c) A Composite attribute of an entity set
 - d) All of the mentioned
15. In relational algebra, _____ operation chooses the subset of tuples from the relation that satisfies the given condition mentioned in the syntax of query whereas _____ operation selects certain required attributes, while discarding other attributes.
- a) SELECT, PROJECTION
 - b) MINUS, INTERSECTION
 - c) CARTESIAN PRODUCT, JOIN
 - d) UNION, JOIN

(Marks – 2*15 = 30 marks)

Essay questions.

1. Consider the below given relations. (15 marks)

| Customer_T | | | | | |
|------------|--------------------------|---------------------|--------------|---------------|--------------------|
| CustomerID | CustomerName | CustomerAddress | CustomerCity | CustomerState | CustomerPostalCode |
| 1 | Contemporary Casuals | 1355 S. Hines Blvd | Gainesville | FL | 32601-2871 |
| 2 | Value Furniture | 15145 S.W. 17th St. | Plano | TX | 75094-7743 |
| 3 | Home Furnishings | 1900 Allard Ave. | Albany | NY | 12209-1125 |
| 4 | Eastern Furniture | 1925 Beltline Rd. | Carteret | NJ | 07008-3188 |
| 5 | Impressions | 5585 Westcott Ct. | Sacramento | CA | 94206-4056 |
| 6 | Furniture Gallery | 325 Flatiron Dr. | Boulder | CO | 80514-4432 |
| 7 | Period Furniture | 394 Rainbow Dr. | Seattle | WA | 97954-5589 |
| 8 | California Classics | 816 Peach Rd. | Santa Clara | CA | 96915-7754 |
| 9 | M and H Casual Furniture | 3720-2314 | | | 20-2314 |
| 10 | Seminole Interiors | 2446-4423 | | | 46-4423 |
| 11 | American Euro Lifestyles | 2408-5621 | | | 08-5621 |
| 12 | Bottle Creek Furniture | 3415-3401 | | | 15-3401 |
| 13 | Heritage Furnishings | 6613-8834 | | | 13-8834 |
| 14 | Kaneohe Homes | 1144-2537 | | | 44-2537 |
| 15 | Mountain Scenes | 4103-4432 | | | 03-4432 |

| Order_T | | |
|---------|------------|------------|
| OrderID | OrderDate | CustomerID |
| 1001 | 10/21/2018 | 1 |
| 1002 | 10/21/2018 | 8 |
| 1003 | 10/22/2018 | 15 |
| 1004 | 10/22/2018 | 5 |
| 1005 | 10/24/2018 | 3 |
| 1006 | 10/24/2018 | 2 |
| 1007 | 10/27/2018 | 11 |
| 1008 | 10/30/2018 | 12 |
| 1009 | 11/5/2018 | 4 |
| 1010 | 11/5/2018 | 1 |

| OrderLine_T | | |
|-------------|-----------|-----------------|
| OrderID | ProductID | OrderedQuantity |
| 1001 | 1 | 2 |
| 1001 | 2 | 2 |
| 1001 | 4 | 1 |
| 1002 | 3 | 5 |
| 1003 | 3 | 3 |
| 1004 | 6 | 2 |
| 1004 | 8 | 2 |
| 1005 | 4 | 4 |
| 1006 | 4 | 1 |
| 1006 | 5 | 2 |
| 1006 | 7 | 2 |
| 1007 | 1 | 3 |
| 1007 | 2 | 2 |
| 1008 | 3 | 3 |
| 1008 | 8 | 3 |
| 1009 | 4 | 2 |
| 1009 | 7 | 3 |
| 1010 | 8 | 10 |

| Product_T | | | | | |
|-----------|----------------------|---------------|----------------------|---------------|--|
| ProductID | ProductDescription | ProductFinish | ProductStandardPrice | ProductLineID | |
| 1 | End Table | Cherry | \$175.00 | 1 | |
| 2 | Coffee Table | Natural Ash | \$200.00 | 2 | |
| 3 | Computer Desk | Natural Ash | \$375.00 | 2 | |
| 4 | Entertainment Center | Natural Maple | \$650.00 | 3 | |
| 5 | Writers Desk | Cherry | \$325.00 | 1 | |
| 6 | 8-Drawer Desk | White Ash | \$750.00 | 2 | |
| 7 | Dining Table | Natural Ash | \$800.00 | 2 | |
| 8 | Computer Desk | Walnut | \$250.00 | 3 | |

- a) Write a SQL statement to generate the below given output using the PRODUCT_T relation. (2 marks)

```
SELECT ProductDescription, ProductStandardPrice
FROM Product_T
WHERE ProductStandardPrice < 275
```

Result:

| PRODUCTDESCRIPTION | PRODUCTSTANDARDPRICE |
|--------------------|----------------------|
| End Table | 175 |
| Computer Desk | 250 |
| Coffee Table | 200 |

- b) What are the standard price and standard price if increased by 10 percent for every product? Refer the resulting relation given. (3 marks)

```
SELECT ProductID, ProductStandardPrice, ProductStandardPrice*1.1 AS
Plus10Percent
FROM Product_T
```

Result:

| PRODUCTID | PRODUCTSTANDARDPRICE | PLUS10PERCENT |
|-----------|----------------------|---------------|
| 2 | 200.0000 | 220.00000 |
| 3 | 375.0000 | 412.50000 |
| 1 | 175.0000 | 192.50000 |
| 8 | 250.0000 | 275.00000 |
| 7 | 800.0000 | 880.00000 |
| 5 | 325.0000 | 357.50000 |
| 4 | 650.0000 | 715.00000 |
| 6 | 750.0000 | 825.00000 |

- c) List product name, finish, and standard price for all types of desks and all tables in the Product table. (3 marks)

```
SELECT ProductDescription, ProductFinish, ProductStandardPrice
FROM Product_T
WHERE (ProductDescription LIKE '%Desk' OR ProductDescription LIKE '%Table')
```

Result:

| PRODUCTDESCRIPTION | PRODUCTFINISH | PRODUCTSTANDARDPRICE |
|--------------------|---------------|----------------------|
| Computer Desk | Natural Ash | 375 |
| Writer's Desk | Cherry | 325 |
| 8-Drawer Desk | White Ash | 750 |
| Dining Table | Natural Ash | 800 |
| Computer Desk | Walnut | 250 |

- d) Retrieve the descriptions of all the products ordered on 11th of May 2018. **(4 marks)**

```
SELECT ProductDescription
FROM Order_T, Orderline_T, Product_T
Where OrderDate='11-05-2018' AND Order_T.OrderID=Orderline_T.OrderID AND
Orderline.ProductID=Product_T.ProductID
```

- e) Display the number of customers in each state. **(3 marks)**

```
SELECT CustomerState, COUNT (CustomerState)
FROM Customer_T
GROUP BY CustomerState
ORDER BY CustomerState;
```

Result:

| CUSTOMERSTATE | COUNT(CUSTOMERSTATE) |
|---------------|----------------------|
| CA | 2 |
| CO | 1 |
| FL | 3 |
| HI | 1 |
| MI | 1 |
| NJ | 2 |
| NY | 1 |
| PA | 1 |
| TX | 1 |

2. Consider the given RENTALS relation. The primary key of the Rentals table is the composite key (RentalID, Title). (30 marks)

| <u>RentalID</u> | <u>Title</u> | CustomerID | RentedDate | Director | MovieCategory | Price |
|-----------------|-----------------------|------------|------------|-------------------------|---------------|--------|
| 1 | Die Hard | 1001 | 3/3/2010 | John McTiernan | Old | \$4.25 |
| 1 | The last man standing | 1001 | 3/3/2010 | Walter Hill | Old | \$4.25 |
| 1 | Wedding Crashers | 1001 | 3/3/2010 | David Dobkin | New | \$5.50 |
| 2 | Dodgeball | 1002 | 3/4/2010 | Rawson Marshall Thurber | New | \$5.50 |
| 2 | Die Hard | 1002 | 3/4/2010 | John McTiernan | Old | \$4.25 |
| 3 | As good as it gets | 1003 | 1/7/2011 | James Brooks | Old | \$4.25 |
| 4 | Forest Gump | 1001 | 1/7/2011 | Robert Zemeckis | Old | \$4.25 |

- a) List down all the functional dependencies exists in the relation given. Clearly state any assumptions you make.
 RentalID, Title -> CustomerID, RentedDate, Director, MovieCategory, Price
 Title -> Director, MovieCategory, Price
 MovieCategory -> Price
- b) Explain the conditions under which the following functional dependency is true:
 RentalID --> CustomerID
 Customer rent only one title at a time
- c) Write a functional dependency that expresses the fact that the cost of all movies in a given category is the same.
 MovieCategory -> Price
- d) **The insertion anomalies, deletion anomalies and update anomalies** as examples of problems that can appear in tables that are not normalized. Give one example each for the three anomaly types mentioned using the RENTAL table.
 Insertion – cannot enter a title without a rentID
 Deletion – cannot delete rent details cause it will remove the title details as well.
 Update – updating the movie category in one instance will create inconsistencies in the table

e) Decompose the Rentals table such that the resulting tables are in 3NF. For each of the resulting tables, give the table name, column names, primary keys, and foreign keys.

- The relation is in 1NF
- Not in 2NF as partial dependencies are there.

RentalDetails

RentalID | Title | CustomerID | RentedDate

Title

Title | Director | MovieCategory | Price

- Not in 3NF as there is a transitive dependency

RentalDetails

RentalID | Title | CustomerID | RentedDate

Title

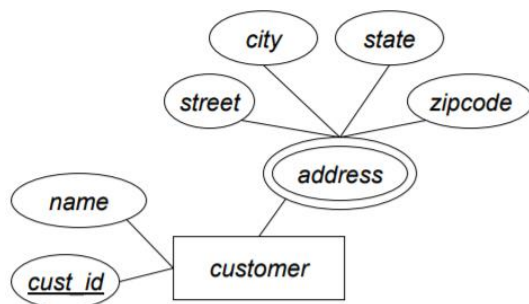
Title | Director | MovieCategory

CategoryPrice

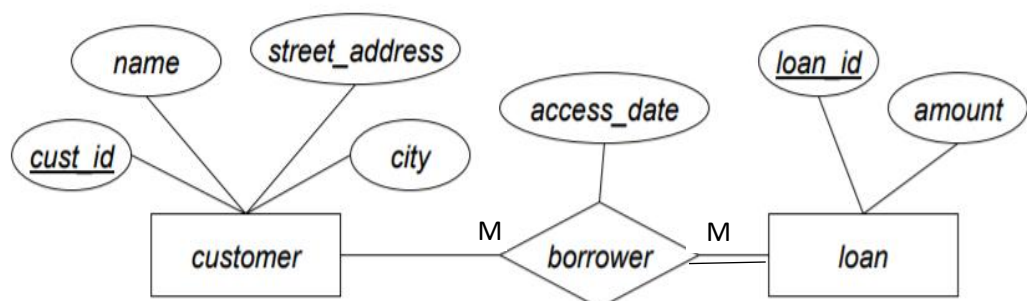
MovieCategory | Price

3. Convert the following ER notations into relation models. (10 marks)

a)



b)



4. Consider you are working for a *database company*, ArtBase, 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. The scenario is as follows.

Galleries keep information 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 groups of 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, total amount of dollars spent in the gallery (very important!), and the artists and groups of art that the customer tends to like.

- a) Write the entity types, their attributes and relationship between the entity types you defined.

Artist

ArtWork

Category

Customer

(15 marks)