Cairo University
Faculty of Computers and Artificial Intelligence

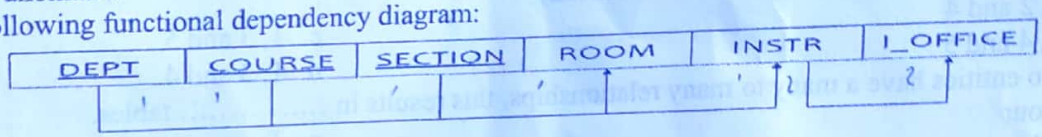
Final Exam Spring 2022

Course Name: Introduction to Database Systems/Database Systems-1	**Semester:** Spring 2021-2022
Course Code: IS211	**Date:** 15-6-2022
Instructors: Dr. Noha Nagy & Dr. Dina Ezzat	**Exam Duration:** 2 Hours

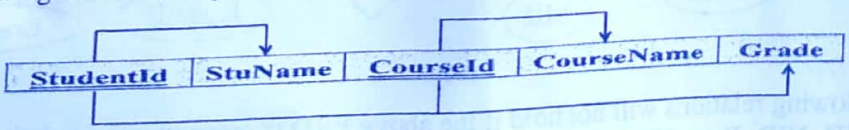
Please answer the following questions in the bubble sheet.

Multiple Choice Questions (Select ONLY one correct answer) **[60 marks]**

1. A functional dependency is a relationship between .....
   a. Entities
   b. Rows
   c. Attributes
   d. Tables
2. The database design prevents some data from being stored due to .....
   a. Deletion anomalies
   b. Insertion anomalies
   c. Update anomalies
   d. Selection anomalies
3. Given the following functional dependency diagram:

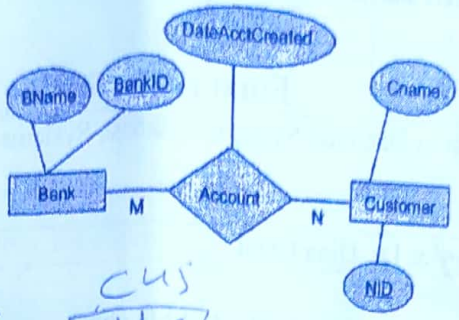


The 3NF of this relation is:
   a. (DEPT, COURSE, SECTION, ROOM, INSTR), (INSTR, I_OFFICE)
   b. (DEPT, COURSE, SECTION, ROOM), (INSTR, I_OFFICE)
   c. (DEPT, COURSE, SECTION, INSTR), (INSTR, I_OFFICE, ROOM)
   d. (DEPT, COURSE, SECTION), (INSTR, I_OFFICE, ROOM)
4. By normalizing relations or sets of relations, ... is minimized.
   a. Data
   b. Fields
   c. Redundancy
   d. Database
5. Which normal form of a relation has no partial functional dependencies?
   a. 1NF
   b. 2NF
   c. 3NF
   d. None of the above
6. A table is in 3NF if it is in 2NF and if it has no .....
   a. Functional dependencies
   b. Transitive dependencies
   c. Trivial functional dependency
   d. Multivalued dependencies
7. Which normal form of a relation has no multivalued attributes?
   a. 1NF
   b. 2NF
   c. 3NF
   d. None of the above
8. Every time attribute A appears, it is matched with the same value of attribute B, but not the same value of attribute C. Therefore, it is true that .....
   a. A -> B
   b. A -> C
   c. A -> (B,C)
   d. (B,C) -> A
9. Given the following functional dependency diagram:



The 2NF of this relation is:
   a. (StudentId, StuName), (CourseId, CourseName), (StudentId, CourseId, Grade)
   b. (StudentId, StuName, Grade), (CourseId, CourseName), (StudentId, CourseId)
   c. (StudentId, StuName), (CourseId, CourseName, Grade), (StudentId, CourseId)
   d. (StudentId, StuName, CourseId), (CourseId, CourseName), (StudentId, Grade)
10. A weak entity .....
    a. Is an entity with no attributes beside its key
    b. Inherits part of its key from the parent entities to which it is related
    c. Is an entity with no key
    d. None of the above

11. Consider the following ER model



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Select the correct relations if the above ER model is mapped into a relational model.

1. **Customer(NID, CName)**
2. **Account(DateAcctCreated, BName, CName)**
3. **Bank(BankID, NID, BName)**
4. **Bank(BankID, BName)**
5. **Account(BankID, NID, DateAccCreated)**

a. 1, 2 and 4
b. 1, 4 and 5
c. 1, 3 and 5
d. 1, 3 and 4

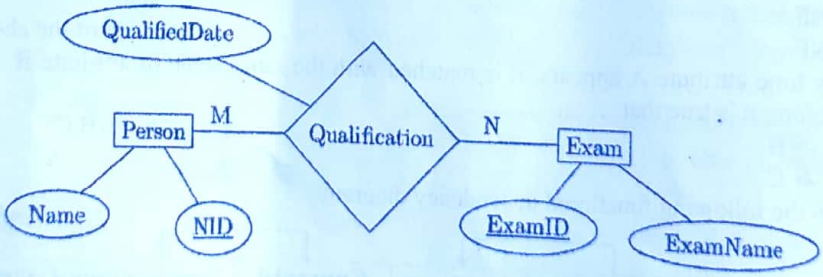
12. If two entities have a many to many relationships, this results in ..... tables.
a. Four
b. Three
c. Two
d. One

13. The primary key in a many to one relationship, acts as a foreign key on which side?
a. On the side where the many relationship is defined
b. On the side where the one relationship is defined
c. On both sides
d. None of the above

14. Ahmed is working on the cardinality of doctors and patients in a large hospital. With the large number of doctors with varying specialties and patients who may have more than one medical problem, he thinks the relationship might be .....
a doctor treats many patients
a patient is treated by 1 or more doctors
a. 1 to 1
b. 1 to many
c. Many to many
d. None of the above

15. Which would most likely NOT be an entity on an ERD?
a. Student
b. Professor
c. Enroll
d. Class

16. Consider the following Entity Relationship Diagram



Which of the following relations will not hold if the above ERD is mapped into a relational model?
a. Exam (ExamID, NID, ExamName)
b. Person (NID, Name)
c. Qualification (NID, ExamID, QualifiedDate)
d. Exam (ExamID, ExamName)

17. The first step in building an Entity Relationship model is to .....
a. Draw the relationships between the entities
b. Identify the attributes for each entity
c. Identify the entities
d. Determine the cardinalities

18. In Relational Algebra, queries are performed using .....
a. Entities
b. Relationships
c. Operators
d. Objects

19. Using the select operation in Relational Algebra, you can select ..... that satisfy certain criteria.
    a. Tuples
    b. Attributes
    c. Operators
    d. None of the above
20. Cartesian product in Relational Algebra is a .....
    a. Unary operator
    b. Binary operator
    c. Ternary operator
    d. None of the above
21. In SQL and Relational Algebra, the common column is eliminated in .....
    a. Theta join
    b. Outer join
    c. Natural join
    d. Composed join
22. Consider the join of a relation R with relation S. If R has m tuples and S has n tuples, then the maximum size of join is .....
    a. mn
    b. m+n
    c. (m+n)/2
    d. All the above
23. Given the following schema:

    Manufacturer (ManufacturerID, ManufacturerName, ManufacturerCity)
    Product (ProductID, ProductName, Model)
    Description (ManufacturerID, ProductID, Price)

    Find the manufacturer names who sell products of model 2 with price equals to 1000.

    a. $\pi_{\text{ManufacturerName}}((\sigma_{\text{Model=2}} \text{ Product } \bowtie_{\text{Product.ProductID = Description.ProductID } \wedge \text{ Price=1000}} \text{ Description}) \bowtie_{\text{Description.ManufacturerID = Manufacturer.ManufacturerID}} \text{Manufacturer})$
    b. $\pi_{\text{ManufacturerName}}(\sigma_{\text{Model=2}} \text{ Product } \bowtie_{\text{Product.ProductID = Manufacturer.ManufacturerID} \wedge \text{Price=1000}} \text{Manufacturer})$
    c. $\pi_{\text{ManufacturerName}}((\sigma_{\text{Model=2}} \text{ Product } \bowtie_{\text{Product.ProductID= Manufacturer.ManufacturerID}} \text{Manufacturer}) \bowtie_{\text{Manufacturer.ManufacturerID = Description.ProductID} \wedge \text{Price=1000}} \text{Description})$
    d. $\pi_{\text{ManufacturerName}}(\sigma_{\text{Model=2}} \text{ Product } \bowtie_{\text{Product.ProductID = Manufacturer.ManufacturerID}} \text{Manufacturer})$
24. Any attribute with a unique constraint is valid to be considered and used as a primary key for the table.
    A. True
    B. False
25. `Select SID, Count (*) From Student Group by SID, SName` is a valid SQL statement.
    But `Select SID, Count (*) From Student Group by SName` is invalid
    A. True
    B. False
26. We can do union or intersection between two tables or result sets with the same number of attributes which are union compatible even they have different column names.
    A. True
    B. False
27. Two different databases can contain tables with the same name and two different tables within the same database cannot contain attributes with the same name.
    A. True
    B. False
28. Recursive relationship should be ONLY one to many relationships and cannot be neither Many to Many nor One to One in any business case.
    A. True
    B. False
29. Two database tables can be joined without explicitly writing a join condition.
    A. True
    B. False
30. **Select X, Y From R Order by X** Union **Select X, Y From S Order by X** is a valid SQL statement
    A. True
    B. False
31. The default relationship cardinality between entities is One to One relationship
    A. True
    B. False
32. A database with 10 tables, 8 tables in 3rd NF and 1 table in 2nd NF and the other table in 1st NF. This database is considered in 3rd NF:
    A. True
    B. False

Assume we have two tables T1 and T2 where T1 has 100 tuples and T2 has 200 tuples and no common records between T1 and T2.

33. If we apply **UNION** between T1 and T2. Then number of tuples in the result set will be:
    A. 100
    B. 200
    C. 300
    D. ZERO
34. If we do T1 **MINUS** T2. Then number of records in the results will be:

A. 100 B. 200 C. 300

D. ZERO

35. If we do T2 **MINUS** T1. Then number of records in the results will be:

A. 100 B. 200 C. 300

D. ZERO

36. Which of the following operation checks for all values in the data set to decide if the condition is evaluated to true or false?

A. IN & NOT IN
B. EXISTS & NOT EXIST
C. EXISTS & IN
D. NOT EXISTS & NOT IN.

37. The maximum guaranteed normal form for a database with tables resulted from weak entity and tables resulted relationships is:

A. 1st Normal Form.
B. 2nd Normal Form.
C. 3rd Normal Form.
D. BCNF

38. If R (X, Y, Z), and X, Y, and Z are composite primary key for R, then the minimum normal form for R from these normal forms is:

A. First Normal Form
B. Second Normal Form
C. Third Normal Form
D. None of the above

39. N-ARY relationship is equivalent to:

A. N-1 Binary Relationships.
B. N-2 Binary Relationships
C. Cannot be Measured
D. None of the Above.

Assume the following database schema:
Student (StudId, StudName, GPA)
Course (CourseId, CourseName)
StudentCourses (StudentId, CourseId)

40. A requirement is submitted to get every course with number of its enrolled students. Two different SQL developers wrote two different SQL queries to satisfy this requirement. Can you judge, are these two queries equivalent and can satisfy the requirement or not?

Developer-1's Query:

```
Select distinct CourseId,
                (Select Count (StudId) From StudentCourses SC2 Where SC1.CourseId = SC2.CourseId) as
                NumberOfEnrolledStudents
From StudentCourses SC1
```

Developer-2's Query:

```
Select CourseId,
       Count (*) as NumberOfEnrolledStudents
From StudentCourses
Group by CourseId
```

A. True B. False