CECS 323
Sample Final

Name _____

Part I (1 pt each)

Match the term with the definition. Please write your answers to the **left** of the numbers.

1. Disjoint Specialization : **Each member of a *superclass* may be a member of no more than one *subclass***

2. Denormalization : **Intentionally "breaking the rules" of *normal forms*.**

3. Subquery : **A query (SELECT statement) that is embedded in another query.**

4. Overlapping Specialization : **Any member of a *superclass* may be a member of more than one *subclass*.**

5. Subclass : **A *class* that inherits common attributes from a parent class, but contains unique attributes of its own. See also *superclass* and *specialization*.**

6. Complete Specialization : **All members of a *superclass* must also be members of at least one *subclass*.**

7. Recursive Association : **An association between a single class type (in one role) and itself (in another role).**

8. Generalization : **(noun) A *superclass*. (verb) The process of designing superclasses from "bottom up."**

9. Incomplete Specialization : **Some members of a *superclass* might not be members of any *subclass*.**

10. BCNF: **Boyce-Codd normal form: a database with no *subkey* in any relation (with no exceptions).**

Part II (2 pts each)

11. What is a database index? Why would you need one?

A database index is a data structure that the database uses to find records within a table more quickly. Indexes are needed because they are used to quickly find data without having to search through every row in the table every time the database table is accessed.

12. What does it mean for a transaction to be ACID? Define and describe each of the letters in ACID.

ACID contains the properties of a database transaction and it is meant to guarantee the validity of the transaction in the event of errors or power failures.

Atomicity : Each transaction is all or nothing. If one part of the transaction fails, then the entire transaction fails and the database is left unchanged.

Consistency: The database is valid from one state/transaction to the next. Any data written to the database must be valid according to the defined rules/constraints.

Isolation: Concurrent execution of transactions result in a system state that would be obtained if the transactions were sequential. I.E. what is visible to users and to the system during concurrent execution is the same as what's visible to users/system during sequential transaction execution.

Durability: Once a transaction is committed, it will remain so even in the event of power loss, crash, or error.

13. What are the criteria of each of the three normal forms as presented in the textbook?

First Normal Form (1NF): eliminate multi-valued and repeated attributes
Second Normal Form (2NF): Eliminate subkeys (where the subkey is part of a composite primary key)
Third Normal Form (3NF): Eliminate subkeys (where the subkey is not part of the primary key)

14. Explain what a recursive relationship is

An association between a single class type (in one role) and itself (in another role). An example of this would be the relationship between managers and employee. Every manager is an employee, but not all employees are managers.

15. Demonstrate that you understand the difference between the concepts of "aggregation" and "composition" in database design.

Draw class diagrams for the following two relationships:

a. Universities and Departments

University ◇ -------(1..1) Departments



b. Motorized vehicles and their parts

motorized vehicles ◆ -----(1..*) parts

Note: In composition, component instances cannot exist on their own without a parent; they are created with (or after) the parent and they are deleted if the parent is deleted. The implied multiplicity on the "diamond" end of the association is therefore 1..1.

Part III (3 pts each)

16. Consider a pizza sold at a restaurant. Model the relationship between a pizza and its ingredients.
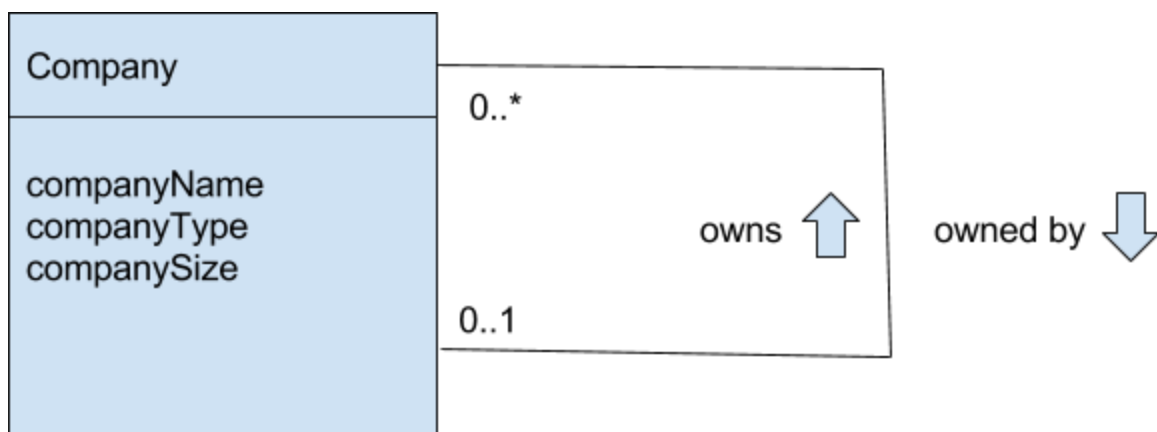
    a. Draw the class diagram

Pizza
pName pType pPrice ingredients:Enumerated
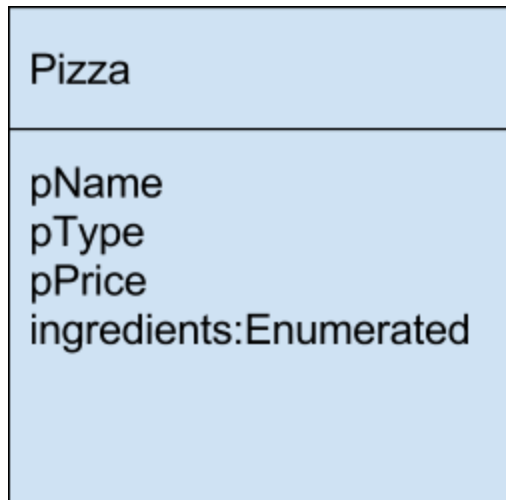
    b. Draw the relation scheme.

17. Use the sample data below for the **COMPANY table to answer the questions**

| company-id	parent-id	company-name
C1	NULL	Big Monster Company
C2	C1	Smaller Monster Company
C3	C1	Other Smaller Company
C4	C2	Big Subsidiary
C5	C2	Small Subsidiary
C6	NULL	Independent Company

a. Draw the class diagram.

b. Draw the relation scheme.

18 Many performers only marry other performers. This marriage can happen several times. Each performer must have a Screen Actors Guild membership card (SAGid) to be considered a performer.

c. Draw the class diagram.

Performer		Marriages
	1..1 0..*	
pName pGender pSagID		startDate endDate
	1..1 0..*	
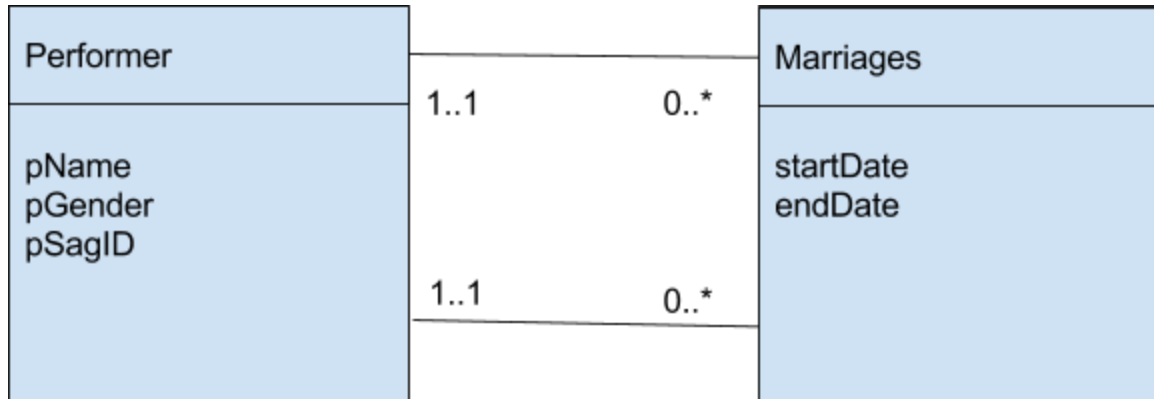
d. Draw the relation scheme.

19. I recently made my first visit to IKEA furniture store. All the furniture at IKEA comes in a box and you must assemble it from different parts. For example, the coffee table I purchased had a top, a shelf, and four legs. The chair had a back, a seat, two arms and four legs.

Draw the class diagram and relation scheme for the build-it-yourself furniture enterprise.

Furniture
furnitureName furnitureType furnitureManufacturer

Part
partName partType
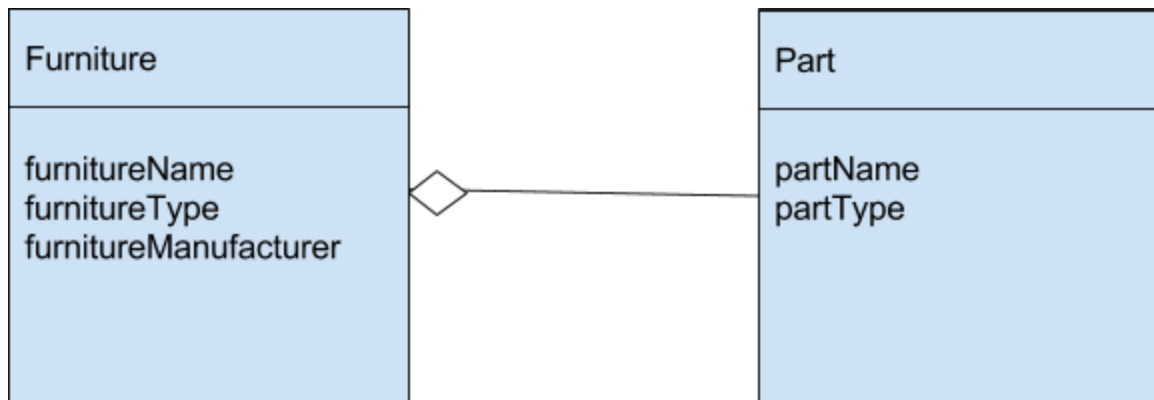
20. Given the following relation:
Student {Student Name (PK), Major, Course#1, ClassTime1, Location1, Course#2, ClassTime2, Location2, Course#3, ClassTime3, Location3}

Provide an analysis relating to the following concepts:

a) 1st Normal Form
b) 2nd Normal Form
c) 3rd Normal Form
d) Choice of Primary Key
e) If you were to fix this relation, what would you do and why (consider everything you have learned this semester)

1NF is not accomplished because there are multiple courses, classTime, and locations. These are multi-valued attributes and they need to be removed.

2NF is not achieved since 1NF was not accomplished.

3NF is not achieved because classTime is a subkey for courses. There cannot be any collisions in the classTimes because that means the student would not be able to go to all classes. Thefore, the classTimes are different and knowing each classTime means knowing the course.

The PK choice is insufficient because multiple students can have the same name. A better choice for a PK would be the studentID or the student's name and an email.

If I were to fix this relation,