

**Part I. Short answer. Write your answers in the space provided.**

- 1) (3 pts.) Distinguish between a data model and a database design.
  
  
  
  
  
  
  
  
  
  
- 2) (6 pts.) When is an entity considered a weak entity? Explain the ambiguity in the broad definition of a weak entity. Give an example.
  
  
  
  
  
  
  
  
  
  
- 3) (3 pts.) What are "business rules" and what is their role in database design? Give an example.
  
  
  
  
  
  
  
  
  
  
- 4) (6 pts.) What is de-normalization in designing relations? Give the primary benefit and the primary disadvantage of de-normalization. When should this technique be used?

5) (16 pts.) Recall our look at the E-R diagram for Heather Sweeney designs based on business documents (she offers free seminars to develop contacts with the hope of making further sales). A sample invoice is at right. Give the E-R design we developed including entities for SEMINAR, CUSTOMER, CONTACT, and INVOICE. Include identifiers and at least one attribute per entity. Use a Crow's Foot diagram and focus on the relations and their cardinalities—briefly explain each connection.

Heather Sweeney Designs  
122450 Rockaway Road  
Dallas, Texas 75227

Invoice No. 35000

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**INVOICE**

Customer		Misc	
Name	Ralph Able	Date	10/15/05
Address	123 Elm Street	Order No.	
City	San Antonio State TX ZIP 78214	Rep	
Phone	210-281-7987	FOB	

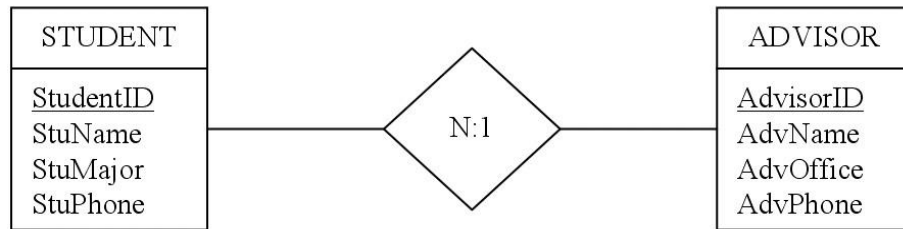
Qty	Description	Unit Price	TOTAL
1	Kitchen Remodeling Basics - Video	\$ 14.95	\$ 14.95
1	Kitchen Remodeling Basics - Video Companion	\$ 7.99	\$ 7.99
			Subtotal \$ 22.94
			Shipping \$ 5.95
			Tax Rate(s) 5.70% \$ 1.31
			<b>TOTAL \$ 30.20</b>

Payment	Credit
Comments Visa	
Name Ralph J. Able	
CC # xxxx xxxx xxxxxxxx	
Expires May-08	

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6) (8 pts.) Write the schema to represent the entities below, including the proper placement of the foreign key and referential integrity constraint.

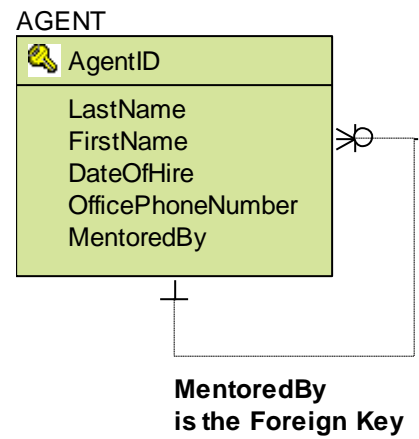


7) (12 pts.) How are many-to-many relationships implemented in the relational model? Give an example, with schema. In this context, explain what an associative entity is.

8) (12 pts.) Give an example of a one-to-one recursive entity/relationship, give its ER diagram, and show its translation to a relational schema. Include some (at least 3 tuples) sample data to match your schema.

9) (10 pts.) Give an example of a subtype relation; give its E-R diagram. Is your relation exclusive or inclusive? Explain what a discriminator is in this situation.

10) (5 pts.) Consider the example of an AGENT at the Pacific Northwest Real Estate Agency (PNREA). Agents at the NWREA may be assigned as a mentor to one or more other agents. Each NWREA mentor can work with several agents at a time. However, each agent being mentored is mentored by only one PNREA agent. The rule that being mentored is required, while being a mentor is not, applies. Therefore each agent mentor is optionally associated with many other mentored agents. Code a SQL statement that creates a table with all columns from the parent and child tables.



11) (4 pts.) a. Is the relationship in problem 10 ID-dependent? Explain.

b. Might a maximum cardinality constraint be appropriate in problem 10? Explain.

12. (15 pts.) Use the tables provided below to produce the following queries:

a. Write a SQL statement to list the Name of employees who have worked on a property in New York.

b. Write a SQL statement to show the Name and sum of HoursWorked for each employee

c. Write a SQL statement to modify all EMPLOYEE rows with an ExperienceLevel of Master to SuperMaster.

## OWNER:

	OwnerID	OwnerName	Email	Type
1	1	Mary Jones	MJones@somewhere.com	Individual
2	2	DT Enterprises	DTE@dte.com	Corporation
3	3	Sam Douglas	SDouglas@somewhere.com	Individual
4	4	UNY Enterprises	UNYE@unye.com	Corporation
5	5	Doug Samuels	DSamuels@somewhere.com	Individual

## EMPLOYEE:

	Initials	Name	CellPhone	ExperienceLevel
1	DRM	Dale R. Murray	206-254-3456	Junior
2	JDM	Jerry D. Murphy	585-545-8765	Master
3	JEF	Joan E. Fontaine	206-254-4567	Senior
4	JHE	John H. Evanston	206-254-2345	Senior
5	SJS	Sam J. Smith	206-254-1234	Master

## PROPERTY:

	PropertyID	PropertyName	Street	City	State	Zip	OwnerID
1	1	Eastlake Building	123 Eastlake	Seattle	WA	98119	2
2	2	Elm St Apts	4 East Elm	Lynwood	WA	98223	1
3	3	Jefferson Hill	42 West 7th St	Bellevue	WA	98007	2
4	4	Lake View Apts	1265 32nd Avenue	Redmond	WA	98052	3
5	5	Kodak Heights Apts	65 32nd Avenue	Rochester	NY	14604	4
6	6	Private Residence	1456 48th St	Bellevue	WA	98007	1
7	7	Private Residence	1567 51st St	Bellevue	WA	98007	3
8	8	Private Residence	567 151st St	Rochester	NY	14604	5

## SERVICE:

	PropertyID	Initials	Date	HoursWorked
1	1	SJS	2006-05-05 ...	4.50
2	2	JHE	2006-05-08 ...	2.75
3	3	DRM	2006-05-08 ...	4.50
4	4	SJS	2006-05-19 ...	3.00
5	5	JDM	2006-05-12 ...	7.50
6	6	JEF	2006-05-10 ...	2.50
7	7	JHE	2006-05-19 ...	2.50
8	8	JDM	2006-05-15 ...	2.75