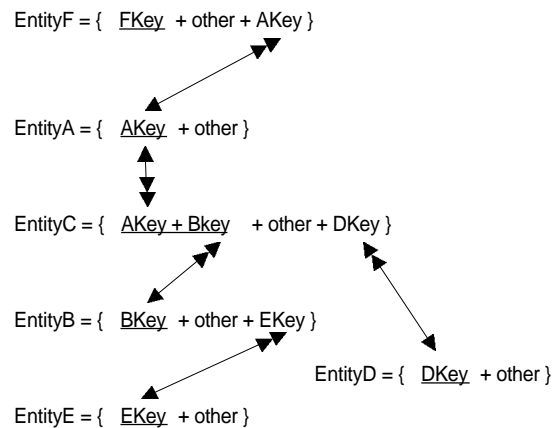


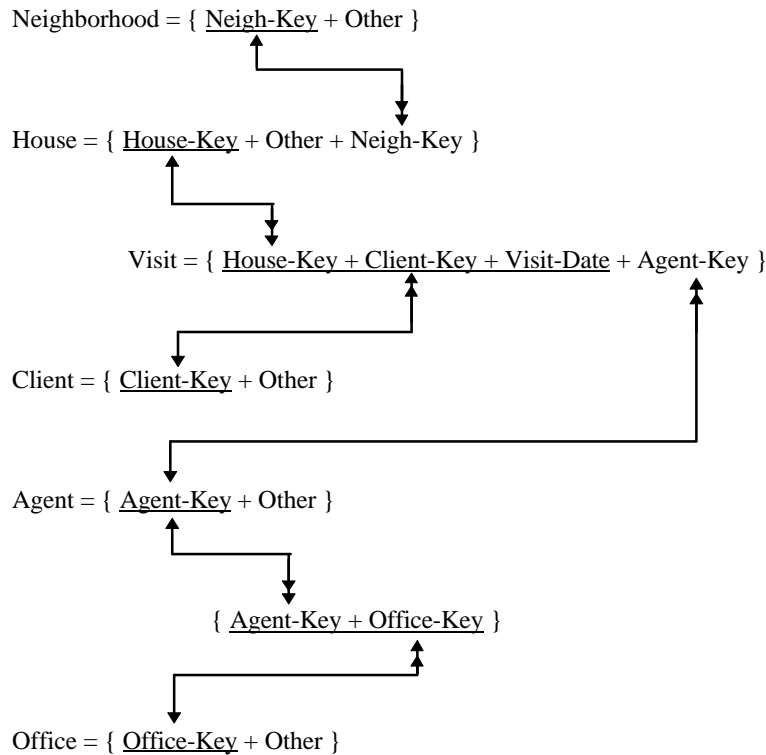
- Using the University's STAR registration system, suggest one change that would be considered a physical change and another change that would be considered a logical change. Make sure that your suggested changes show you understand the difference between a physical model and a logical model.
- Convert the following RSD to an Entity-Relationship Diagram:



- For each of the following scenarios, suggest the single most appropriate conversion approach that should be used. If you suggest either pilot or phased, also indicate if parallel or direct should be used within the pilot or direct conversion.
 - A university currently has a registration system where students must go to a specific location to register for courses. Students have pre-assigned appointment times and when they arrive, they are allowed to register for open courses assuming that they have the appropriate prerequisites. The current system uses computer technology to keep track of course availability and student schedules. Like most universities, students at this university may take many different courses. For example, a senior might register for a 100-level history course in order to satisfy some distribution requirements.

The university has designed a new a telephone-based registration system (like the UW's STAR system) and they need to develop an approach to convert to the new system.
 - A small firm is currently using a manual accounts receivable system. A large percentage of this firm's sales are made on a credit basis so its correct operation is very important. The firm is in the process of designing and implementing a computer-based A/R system and needs to develop a conversion plan. While correct operation of the new system is critical, the firm is also concerned with the costs associated with the conversion.

4. A real estate office supports its data requirements with the following Record Structure Diagram:



Each of the following statements relates to possible business rules of the real estate office. For each statement, indicate if it CAN or CANNOT be supported by the RSD above.

- a. It is possible to record the visit of a specific client to a specific house two or more times on the same day.

CAN or CANNOT be supported

- b. Two or more agents can escort a client on a specific house visit.

CAN or CANNOT be supported

- c. Agents can be assigned to two or more offices at the same time.

CAN or CANNOT be supported

- d. If clients specify a preference for a specific neighborhood, it is possible to create a list houses in that neighborhood to show them.

CAN or CANNOT be supported

- e. It is possible to record the visit of a specific client to a specific house two or more times on the same day as long as they do so with a different agent each time.

CAN or CANNOT be supported

5. You are given the following spreadsheet that computes the net present value of the cash flows for a hypothetical capital asset.

Estimated Model Parameter Values						
Purchase Cost	\$ 350,000					
Life (years)	8					
Resale Value	\$ 30,000					
Annual Revenues	\$ 225,000					
Annual Expenses	\$ 125,000					
Tax Rate	33.0%					
NPV Discount Factor	15.0%					
Cash Flow Model						
Year	Revenues	Expenses	Depreciation	Taxes	Additional Revenue	Cash Flow
1	\$ 225,000	\$ 125,000	\$ 77,778	\$ 7,333	\$ -	\$ 92,667
2	\$ 225,000	\$ 125,000	\$ 68,056	\$ 10,542	\$ -	\$ 89,458
3	\$ 225,000	\$ 125,000	\$ 58,333	\$ 13,750	\$ -	\$ 86,250
4	\$ 225,000	\$ 125,000	\$ 48,611	\$ 16,958	\$ -	\$ 83,042
5	\$ 225,000	\$ 125,000	\$ 38,889	\$ 20,167	\$ -	\$ 79,833
6	\$ 225,000	\$ 125,000	\$ 29,167	\$ 23,375	\$ -	\$ 76,625
7	\$ 225,000	\$ 125,000	\$ 19,444	\$ 26,583	\$ -	\$ 73,417
8	\$ 225,000	\$ 125,000	\$ 9,722	\$ 29,792	\$ 30,000	\$ 100,208
Net Present Value						\$ 35,590

Using this specific model, describe possible “what if”, “sensitivity analysis”, “goal seek”, and “risk analysis” scenarios. Be sure that your description is both specific to this model and clearly shows an understanding of each analytical modeling approach.

6. Assume that the Executive MBA Program (EMBA) at the UW is planning on extending its program beyond the Seattle campus beginning in autumn quarter 1998. To do this, they are considering using RealVideo technology like we saw earlier this quarter (the demonstration that showed FOX News as a live broadcast). With this technology, students would be able to see a live class session broadcast from Seattle using any computer connected to the Internet.

Speculate on the feasibility of this plan in the following three areas. Be sure that your discussion demonstrates an understanding of these areas of feasibility.

- a. Technical feasibility.
- b. Organizational feasibility.
- c. Schedule feasibility.

7. When designing a relational database, the data for separate entities are stored in their own tables. These tables are linked using foreign keys, correlation tables, and associative objects. Thus the key field for an entity may end up in several other tables.

One of the main problems associated with the traditional file approach is the data redundancy problem where the same data fields are stored in more than one file. It would seem that in a relational database we still have this data redundancy problem.

Explain why data redundancy in a relational database as described above does not cause the same problems that it does in the traditional file approach.

8. The following statements are pertain to application controls in a transaction processing system. Classify each statement as either True (T) or False (F).

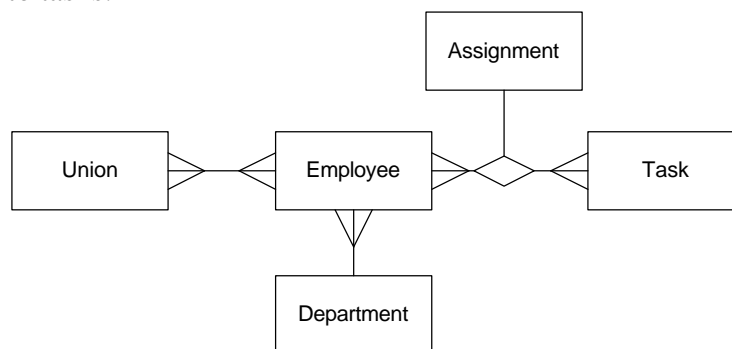
T or F a. A hash total can be used with an on-line TPS to detect an error in a key field.

T or F b. A reasonableness check is useful for detecting lost transactions in a batch system.

T or F c. Quantitative totals are only valid with on-line transaction processing systems.

T or F d. A check digit is used in banking applications to reduce the likelihood that someone can change the amount of a check after it is written.

9. You are given the following ERD used primarily to describe the assignment of employees to tasks:



You are also given additional information on the size (in bytes) and number of entities (note that these sizes do not include foreign keys).

Entity	Size of Key	Size of Non-key Attributes	Total Size*	Number of Entities
Union	10	40	50	10
Employee	8	72	80	300
Department	5	95	100	20
Task	12	63	75	50

**Total Size does not include foreign keys*

Assume that when an employee is assigned a task, 20 bytes of information (start date, end date, number of hours) need to be recorded. Also assume that each employee is assigned to an average of 10 tasks. Finally, assume that each union has an average of 50 employees.

Given this information, compute the size of each table in a relational database. Assume no expansion or overhead. Show your work for partial credit.

10. Each of the following data definitions may contain dependency and/or repeating field problems. For each, identify the problem(s) and then show how to fix it/them. Be sure to explicitly state any assumptions.

a. Customer = { CustId + CustName + DeptCode + DeptDesc + CustAddr }

b. Rental = { ItemNo + CustNo + CustName + ItemDesc + RentalReturnDate }

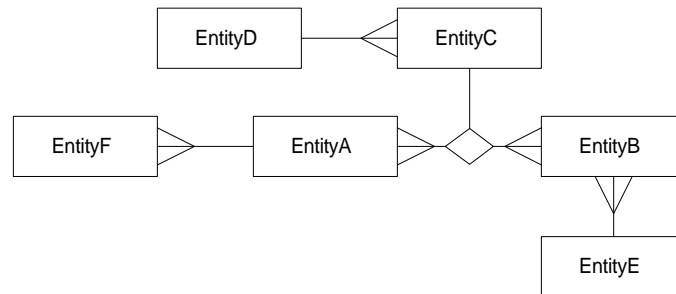
c. Order = { OrderNo + ProdNo1 + ProdDesc1 + Qty1 + ProdNo2 + ProdDesc2 + Qty2 + ProdNo3 + ProdDesc3 + Qty3 }

Suggested Answers:

1. A physical change would involve some change in technology. For example, to reduce the chances of imposters, telephone access could be replaced with kiosks around campus that include some form of biometric-based authentication.

A logical change would involve some change in functionality of the system (independent of technology). For example, having STAR enforce course prerequisites would be such a logical change.

2.



3. a. A pure parallel approach would not be feasible because it would be impossible to keep the two databases synchronized. It appears that a phased approach does not make sense either since there are no obvious “subsystems” to phase in.

This leaves direct and pilot as possibilities. A direct approach would be viable – all students would register using the new system beginning with the “conversion quarter”. A pilot approach could also be tried. For example, all students who register during a specific registration period could use the new system. If this was the case, then it would have to be pilot/direct since parallel is not feasible (even during the pilot period).

b. A parallel approach is the only one that makes sense here. Direct is too risky. There are no facts in the problem that suggest any feasible organization subsets that might be used in a pilot conversion. Similarly, there is nothing stated in the problem that can be used as the basis for phases.

4. a. CANNOT. Would need to have a Time field as part of the key to do this.
b. CANNOT. Agent-Key would need to be part of the compound key.
c. CAN.
d. CAN.
e. CANNOT. Agent-Key would need to be part of the compound key.

5. “What if.” What would happen to the NPV if the purchase cost was changed to \$400,000?

“Sensitivity analysis.” Is the NPV more sensitive to changes in purchase cost, resale value, or tax rate?

“Goal seek.” What tax rate would produce a NPV = 0?

“**Risk analysis.**” What is the probability of having NPV exceed zero assuming the purchase cost averages \$350,000 with a standard deviation of \$20,000?

6. a. **Technical feasibility.** This answer should focus on whether the technology works. One technical issue is to how well the Internet and RealVideo can support real-time viewing of a “live” broadcast.
- b. **Organizational feasibility.** This answer should focus on how well the plan fits into the organization’s norms and expectations. One question to evaluate here would be the faculty’s willingness to deliver a course in this manner.
- c. **Schedule feasibility.** This answer should focus on whether the solution can be implemented by a deadline. The plan calls for implementation beginning autumn quarter 1988 so one needs to ask if this is possible.
7. The data that are duplicated as foreign keys, correlation tables, and associative objects a relational database are all key fields in other tables. It is uncommon to change the value of a key for a specific instance of an entity. The main problem with redundant data in the traditional file approach is data inconsistencies that could result from a failure to change all duplicated data. Since the values of a key rarely change, data inconsistency is not likely.
8. a. **False**
b. **False**
c. **False**
d. **False**
9. **Union** = 50 bytes/union x 10 unions = **500 bytes**
Union/Employee correlation table = (10 + 8) bytes/entry x
50 entries/union x 10 unions = **9,000 bytes**
Employee = (80 + 5) bytes/employee x 300 employees = **25,500 bytes**
Assignment = (8 + 12 + 20) bytes/entry x 10 entries/employee x
300 employees = **120,000 bytes**
Task = 75 bytes/task x 50 tasks = **3,750 bytes**
Department = 100 bytes/department x 20 departments = **2,000 bytes**
10. a. Includes a transitive dependency. Correct as:
Customer = { CustId + CustName + DeptCode + CustAddr }
Department = { DeptCode + DeptDesc }
- b. Includes two partial dependencies. Correct as:
Rental = { ItemNo + CustNo + RentalReturnDate }
Customer = { CustNo + CustName }
Item = { ItemNo + ItemDesc }
- c. Includes repeating fields and a transitive dependency. Correct as:

Order = { OrderNo + ProdNo + Qty }
Product = { ProdNo + ProdDesc }