1. (10) Each of the following table definitions contains one or more problems. Find the problem and rewrite the definition in a way that eliminates the problem. You do not need to draw arrows between tables. Assume that each field that ends in "ID" would have unique values if listed in a table by itself.

   a. Student = {StID + StName + MajorID + MajorDesc + AdvisorID + AdvisorName }

   b. Trans = { StID + CourseID + StName + CourseDesc + Quarter + Grade }

   c. Order = { OrderID + CustID + CustName + Prod1ID + Prod1Desc + Prod2ID + Prod2Desc + Prod3ID + Prod3Desc }
   (assume that none of the Prod#IDs can ever be equal)

2. (6) For each of the following, identify the type of feasibility being evaluated (no justification is necessary).

   a. A manufacturing firm is considering placing desktop PCs on their manufacturing floor to allow machine operators to enter data via a keyboard. The firm is concerned that the oil and acids used in its manufacturing process might damage the PC and keyboard.

   b. A law firm is considering replacing its PCs with network computers (NCs). A NC is connected to an Intranet and does not have any local storage (it uses the Intranet for all storage). The firm knows that this technology is new and untested and they are concerned about this.

   c. The law firm described in (b) above is motivated by the potential cost differences between standard PCs and NCs. The estimated cost of a NC is $750 and the cost of a PC is $2,500. The firm is evaluating the functionality of NCs versus PCs and the relative cost differences.

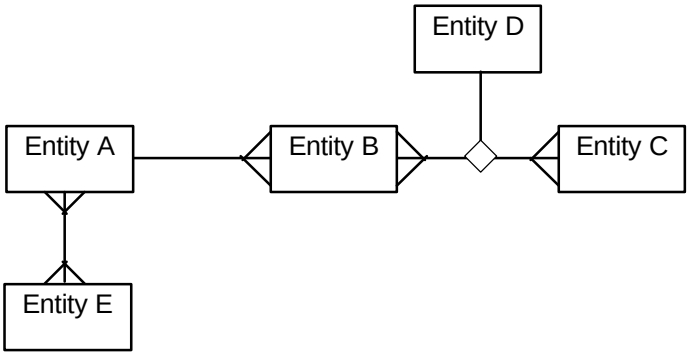
3. (9) For each of the following systems, indicate whether the traditional SDLC methodology or the prototyping methodology is most appropriate. You do not need to justify your answer.

   a. A DSS to be used by marketing managers to help them react to the actions of their competition.

   b. An Internet-based order entry system used by a software developer to sell software.

   c. A system to be developed for a private utility to help justify rates. Rates must be approved by a state utilities commission. Rate requests vary from year to year and depend on a number of factors including political considerations, the cost of purchasing power, etc.

4. (11) Convert the following ERD into a RSD. Use terms like “AKey” and “BKey” to specify key fields. Clearly show key fields by underlining them. Show required other fields with the term “other fields”.



5. (6) For the following situations, define the most appropriate conversion approach. If you choose pilot or phased, indicate whether parallel or direct should be used within the pilot or phased approach. You do not have to justify your choice. Write your answers in the left margin.

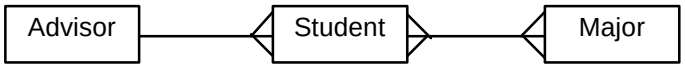
   a. A chain of restaurants is replacing their current cash register system with a new system that uses touch screen technology. They are concerned about the conversion because if the new system fails, the restaurant cannot conduct business (they have determined that there is not enough space in a restaurant for both the old and new registers).

   b. A private utility is converting its financial systems to a new software package. This financial package includes A/P, A/R, general ledger, and financial planning modules. The utility is very concerned that the new package operates correctly or else the financial integrity of the utility could be in jeopardy.

      They have determined there is sufficient capacity on their current computer to support both systems. They have also determined that the new general ledger module can be implemented independent of the other modules.

6. (9) Explain why the systems analysis process separates functional requirements into physical and logical models.

7. (9) You are given the following ERD that describes students at a university and their advisors and majors.



You are also given the size (in bytes) of each entity plus the number of entities.

Entity	Size of Key	Size of Other	Total Size*	No. of Entities
Advisor	10	90	100	350
Student	5	135	140	30,000
Major	15	35	50	60

**Does not include foreign keys*

Assume that there are an average of 750 students in each major. Given this information and assuming no space for expansion or overhead, compute the size of each table in the relational database that implements this ERD. Show your work.

8. (6) For each of the following, identify the appropriate TPS data quality check. You do not have to justify your answer.

   a. A firm receives invoices for purchases it has made on a daily basis. Each Friday the firm processes these invoices and produces checks to pay the amount due. Invoice processing involves several steps including verifying that the invoice is valid, determining that the materials have actually arrived, and insuring that the invoice amount is correct. The firm wants a way to ensure that no invoices are lost during processing.

   b. Referring to the invoices in (a) above, the firm wants to control for the possibility that someone might change the amount due on an invoice after the amount due has been verified.

   c. Two banks are merging and as a result, they need to develop a new set of account numbers for existing customers of both banks. They want to develop account numbers that are difficult to enter incorrectly during any data entry process.

9. (8) In a relational database, what is a foreign key and what function does it serve?

10. (8) Given the following description, create an ERD.

    A construction firm needs to store data relating to the projects it is working on. A project is identified by a unique project identifier and includes other data such as project description, completion date, etc.

    Each project is managed by a single project manager. Information about project managers includes a unique employee number plus other fields. Project managers generally have responsibility for several projects.

    Projects are commissioned by one or more clients. Information about clients includes a unique client number, client name, and address. If clients are satisfied with the work of the firm, they often return for additional projects.

    The firm contracts with subcontractors to do the actual work. Subcontractors are identified by a unique subcontractor identifier. Other data on subcontractors include name, address, and phone number. Each project potentially has several subcontractors. If the firm is satisfied with the work of

a subcontractor, it often asks the subcontractor to work on additional projects. When a contract is written for a subcontractor to work on a project, the completion date and fee needs to be stored.

11. (9) Each of the following situations describes a DSS analytical modeling approach. For each, identify the specific modeling approach (you need not justify your answer). Write your answer in the left margin.

    a. A financial model calculates yearly cask flows based on a number of assumptions. One assumption is the estimated future tax rate.

       In his State Of The Union Address, the President indicates that he will be asking Congress for a tax rate reduction. The firm using this financial model wants to assess the impact of the tax rate reduction on future cash flows.

    b. A firm has a *pro forma* income statement model (projects income statements into the future). They use this model for pricing decisions (among other things). They have set a profit target of $1 million for next year and they want to know what they should set their price at to achieve this profit figure.

    c. While designing a financial planning spreadsheet, the financial analysts indicate that values for several of the parameters should be modeled by indicating the mean (average) value and the standard deviation. For example, the estimated future revenues parameter should be modeled using an average of $450,000 and a standard deviation of $100,000.

12. (9) Two problems associated with the traditional file-oriented approach to storing data include the data inconsistency problem and the data integration problem. Explain how a relational database helps reduce these problems.

1. a. Contains transitive dependencies.

   { StID + StName + MajorID + AdvisorID }
   { MajorID + MajorDesc }
   { AdvisorID + AdvisorName }

   b. Contains partial dependencies.

   { StID + CourseID + Quarter + Grade }
   { StID + StName }
   { CourseID + CourseDesc }

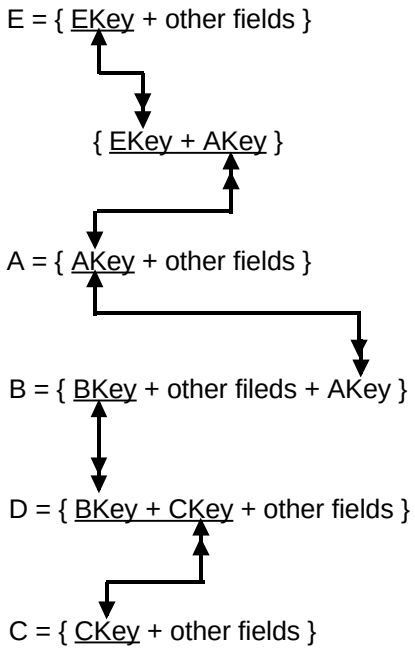
   c. Contains repeating fields and transitive dependencies.

   { OrderID + CustID }
   { CustID + CustName }
   { OrderID + ProdID }
   { ProdID + ProdDesc }

2. a. Operational
   b. Technical
   c. Economic

3. a. Prototyping
   b. Traditional SDLC
   c. Prototyping

4. RSD:



5. a. Pilot/Direct
   b. Phased/Parallel

6. An important goal of systems analysis is that the functionality of the system must be accurately defined regardless of the technology chosen to implement the system. Separating the physical model (with technology) from the logical model (requirements without concern for technology) helps meet this goal.

7. Advisor = 100 bytes/entity x 350 entities = 35,000 bytes

   Student = (140 + 10) bytes/entity x 30,000 entities = 4,500,000 bytes

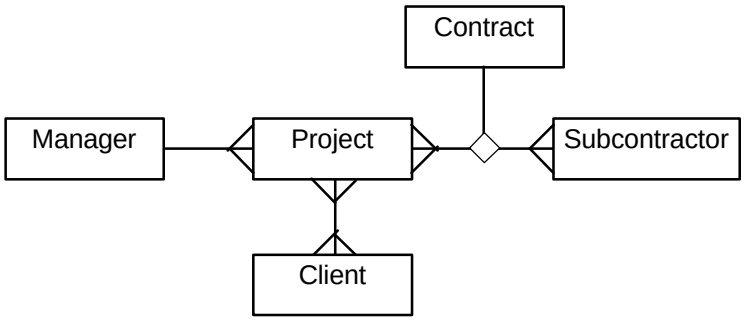
   Major = 50 bytes/entity x 60 entities = 3,000 bytes

   Student/Major Correlation Table = (5 + 15) bytes/entry
   60 Majors x 750 entries/Major = 45,000 entries
   20 bytes/entry x 45,000 entries = 900,000 bytes

8. a. Batch total (record count)
   b. Quantitative total
   c. Check digit

9. A foreign key is a field in a table that is not the key in that table but is the key in another table. A foreign key allows two tables to be linked by matching values in the key and foreign key fields. Foreign keys support both one-to-one and one-to-many relationships.

10. The ERD is:



11. a. What if
    b. Goal seek
    c. Risk analysis

12. A relational database reduces the data inconsistency problem by storing information on an entity once in a table in the database. For example, an employee's address would be stored only once in the Employee table. If the data is only stored once, there is no chance that redundant copies will store different information and be inconsistent.

    The data integration problem is reduced because tables can be defined with foreign keys, correlation tables, and associative objects. These are used when the query is processed to bring together data from many different tables.