

University of Toronto
Faculty of Arts and Science
Department of Computer Science

CSC340S - Information Systems Analysis and Design

Spring 1999

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April-May Examination

No Aids Allowed
Duration: 2 hours

Make sure that your examination booklet has 12 pages
(including this one). Write your answers in the space provided.

This examination counts for 35% of your final mark.

Name:

(Please underline your last name)

Student Number:

Question Marks

1. _____/10

2. _____/10

3. _____/10

4. _____/10

5. _____/10

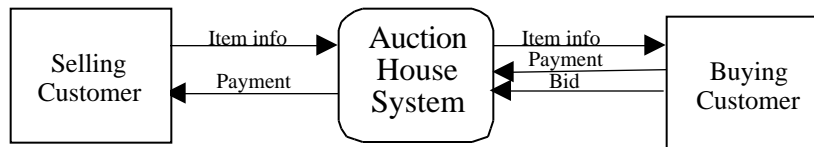
6. _____/20

Total _____/70

1. [Data Flow Diagrams; 10 marks]

A systems analyst collects the following information about a project she is working on for an auction house. To assist her, draw *context and level 0* data flow diagrams .

The auction house has selling customers, who want to put up an item for sale, and buying customers, who buy an item at an auction. Selling customers ask the auction house to sell an item on their behalf. The auction house decides whether to accept the request and maintains a record for all accepted requests. Buying customers register with the auction house and participate in auctions. Auctions are conducted by giving buying customers information about an item, then taking bids. The auction determines a buying customer for each item put up for sale. The sale is completed when the buying customer pays for the item. The auction house sends a portion of the sale income to the selling customer who put up the item for sale in the first place. Of course, the auction house keeps track of all auctions (which are conducted every few weeks) and all sales at each auction.

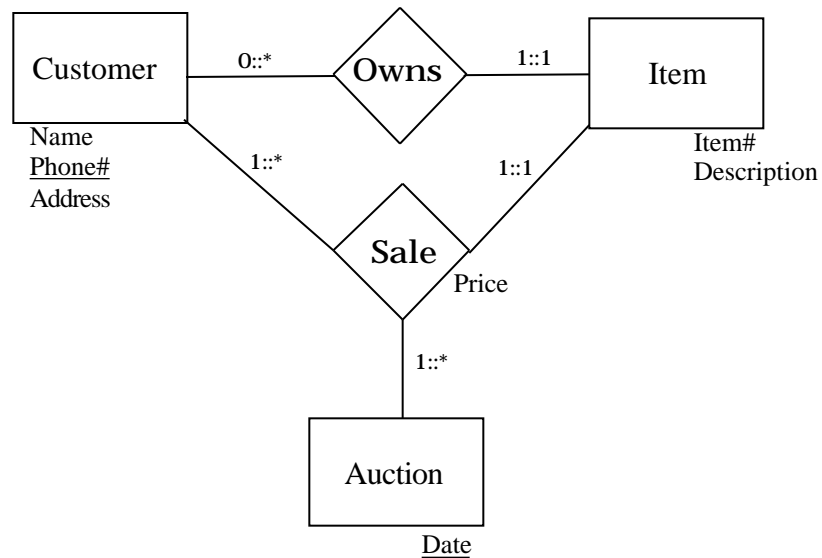


1. [Data Flow Diagrams; 10 marks -- continued]

2. [Entity Relationship Diagrams; 10 marks]

Draw an Entity-Relationship diagram that describes the contents of the auction house database. You may assume that the auction house records name, phone number and address information for all customers. For each item, the auction house database contains a unique identifier (call it item#), a description, its owner, and the auction during which it was sold. For each auction, the database stores the date, the items put up for sale, who their buyer was, and their sale price.

Your diagram should show clearly attributes and keys for all entity and relationship types, also cardinalities for relationships.

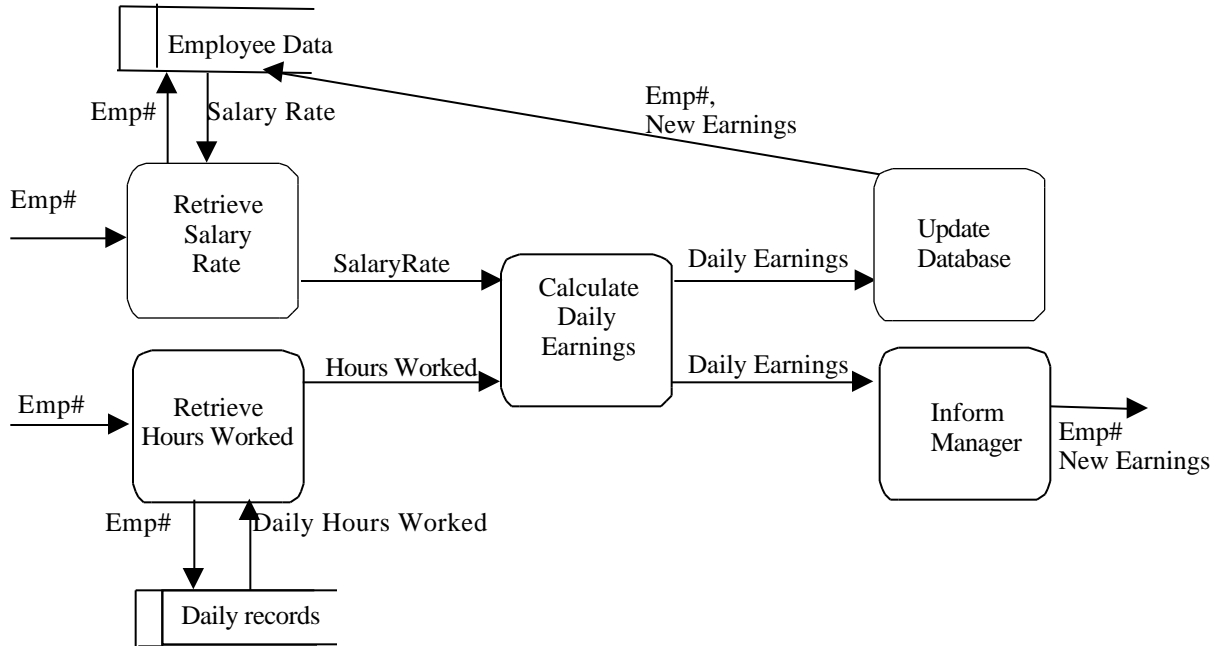


3. [User Interface Design; 10 marks]

Design the dialogue structure for long-distance telephone calls using a state transition diagram. For each transition indicate clearly the input from the caller and the output of the telephone system. A long-distance call dialogue begins when the caller dials "0-XXX-YYY-YYYY", where "XXX" is an area code and "YYY-YYYY" is a local telephone number. The system asks the caller to input "1" if she will use a telephone card to pay for the call, or "2" if the call is collect. If it is the former case, the system asks for the card number, gets it (a 12-digit number), checks that it's valid from a central database and gives the caller the go ahead to make the call. If it is the latter case, the system calls the number, asks the caller to pronounce her name, and asks the person who answered the call whether she will accept charges. If yes, the call proceeds otherwise the call terminates. The caller can terminate the call at any time by hanging up.

4. [Program Design -- Structure Charts; 10 marks]

Consider the data flow diagram shown below which describes the calculation of an employee's daily pay for an employee information system. Use transform analysis to construct a structure chart which describes the module structure for a program that implements this diagram.



4. [Program Design; 10 marks -- continued]

5. [Database Design; 10 marks]

Propose a relational schema for a database which captures information about products produced by different departments within an organization. Products are produced in batches and use ingredients which are purchased from outside vendors. More specifically, the database maintains the following information:

For products:

- Product name, number and description;
- Quantity, date and department for each production batch of a product;
- Ingredients used for each production batch, and in what quantity; quantities are defined in terms of two attributes, number and unit (e.g., number: 2.1, unit: kilograms).

For ingredients:

- For each ingredient purchase, the vendor who sold the ingredient, date, quantity and total cost;
- The ingredient's name, description, code number and for what products was it used (an ingredient may be used for many products)

For departments:

- Department name and manager;
- Products produced and dates of all production;

Is your schema in 3NF? If yes, explain your answer. If not, explain the reasons and place it in 3NF.

[Note: You don't have to draw an Entity-Relationship diagram before giving your relational schema; however, you may find such a diagram useful in deciding what relations to include in your schema.]

6. [Short Questions; 20 marks total]

- (a) **[State Transition Diagrams; 5 marks]** Give a state transition diagram (STD) which accepts input strings consisting of “0”s and “1”s, ending with the special character “\$” and such that:
- The output of the STD is “YES” if the input is a string of the form “01\$”, “0101\$”, ... , “01 (n times) \$”
 - The output is “NO” for all other input strings.
- (b) **[Decision Tables; 5 marks]** Draw a decision table for the following decision procedure for travelling to a place X:
- “If the place you are travelling to is within 150km, take your car; if the place is between 150km and 600km, take a train if the travel is for a holiday, and a plane otherwise; for travel over 600km take a plane”.

- (c) **[Software Architectures; 5 marks]** Suppose you have to build an information system which stores and maintains information about all activities during a software development project. In particular, the system stores different versions of software components as they become available, external documentation in the form of reports, user and reference manuals (with different versions), stores project tasks, who was assigned to each task and when was the task completed. In addition, the system keeps track of meetings, test data, test runs, bug fixes etc.

For hardware, the project will use several workstations for project participants, as well as a central server where all the project information is kept. All machines are connected with an ethernet LAN.

Choose a software architecture for the information system. Explain carefully your choice (the explanation is worth all 5 marks).

- (d) **[Other phases; 5 marks]** List other activities that need to take place after system design and before an information system is fully operational.

(Scratch paper)

(Scratch paper)