CMSC 461 Homework 5 Solutions

Section 101 - Out Dec. 2, Due Dec 9.
Section 201 - Out Dec. 1, Due Dec. 8

1. Hierarchical Databases

   (a) Consider the Hierarchical Database Schema for the COMPANY database showin in Figure 10.10 and corresponding PASCAL programming variables shown in Figure 10.12. Write a program using the Hierarchical DML (IMS or Ch. 10 version) in your favorite programming language (or pseudocode) to process the query from problem 6.19a (p. 170):

   Retrieve the names of employees in department 5 who work more than 10 hours per week on the 'ProductX' project.

   Solution

```
GET UNIQUE PATH DEPARTMENT WHERE DNUMBER=5
                EMPLOYEES;
while (DB_Status =0) do
{
  GET VIRTUAL PARENT EMPLOYEE OF DEMPLOYEES;
  GET NEXT PWORKER WITHIN VIRTUAL PARENT EMPLOYEE;
  While (DB_Status =0) do
    {
      if (P_Pworkers.hours > 10)
           {
             GET PARENT PROJECT OF PWORKER;
             if (p_project.pname = 'ProductX' )
              {
                 print p_employee.fname, p_employee.lname;
                 break;
               }
            }
      GET NEXT PWORKER WITH VIRTUAL PARENT EMPLOYEE;
     } /* end for each works on record */
   GET NEXT DEMPLOYEES WITHIN PARENT DEPARTMENT;
 }
```

   (b) An E/R diagram of a database for a library system is shown below. The system has several libraries, each with a name, address (addr), and a phone number (phone). The library wants to keep track of the assignments of different copies of books to the various libraries as well as information about each of the books either available or on order. In particular, each book has an id number (ISBN) and title. The ISB is assigned by the publisher. The library system assigns a call# to each book once a copy arrives. There may be several copies of each book. All copies of a book get the same call#. However, each copy of a book has a unique id#. The purchase date (pdate) of a copy is also recorded. Each copy is assigned to a particular library. Orders for new books are made by each library. Which libraries have ordered what books must also be recorded along with the order date (odate).

   Define an equivalent set of hierarchical databases. Redundencies should be eliminated, but symmetry should be retained.

   see last page

2. Network Databases

   (a) Consider the network Database Schema for the COMPANY database showin in Figure 11.10 (p. 298) and corresponding PASCAL programming variables shown in Figure 11.11. Write a program using the Network DML in your favorite programming language (or pseudocode) to process the query from problem 6.19a (p. 170):

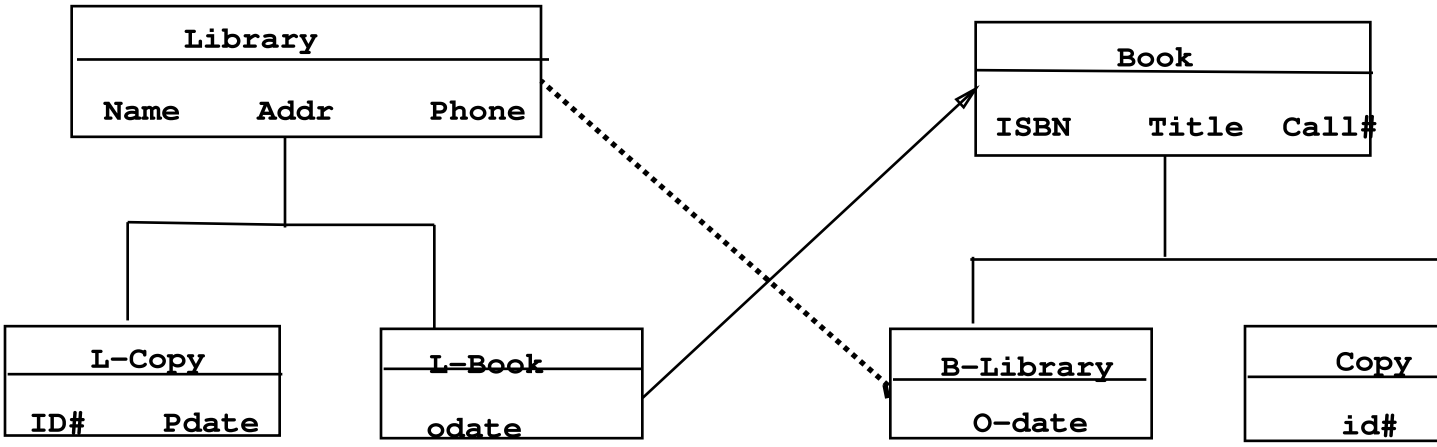
   > Retrieve the names of employees in department 5 who work more than 10 hours per week on the 'ProductX' project.

   Solution

```
MOVE 5 to number in DEPARTMENT
FIND CALC DEPARTMENT USING NUMBER
if DB_Status =0
  {
    FIND FIRST EMPLOYEE WITHIN WORKS_FOR
    while (DB_Status =0)
     {
       GET EMPLOYEE
       FIND FIRST WORKS_ON WITHIN E_WORKSON
       while (DB_Status =0)
        {
         GET WORKS_ON
         if (hours > 10)
           FIND OWNER WITHIN P_WORKSON;
           GET PROJECT
           if (project.name='ProductX')
              print employee.fname, employee.lname;
              break;
         FIND NEXT WORKS_ON WITHIN E_WORKSON
         }
       FIND NEXT EMPLOYEE WITHIN WORKS_FOR
     }
  }
```

   (b) You have been asked to help design a computer system for the new CS 461 Bus Company. The company has several busses, each of which has a serical number (ser#), type and purchase date (PurDate). Each different type of bus has a different capacity. Bus service is to be provided on several different routes (Route#). A route has a starting location (StartLoc) and end location (FinLoc). Different Runs (Run#) are made on each route starting at different times. Different routes are ditinguished by the Route# and starting time (StartTime). Different runs on the same route may require a bus with a different capacity (ReqCap) depending on the starting time. It is assumed that the runs occur at the same time each day. The date that the assignment was made (DateAsn) is also needed. The company would like to have all the information on-line. An E/R diagram for the database is shown below. Your job is to transform this design into a network design.

Problem 1B



Problem 2 B