Name ______________________________

Introduction to Expert Systems
EE 4785
Midterm Examination

10 March 1995, 10:40-11:30 C. S. T.

Problem 1	________	(34 pts)
Problem 2	________	(33 pts)
Problem 3	________	(33 pts)
Exam Total	________	(100 pts)

Good Luck!

Problem 1: Johnny is on a calorie-limited diet, much to his dismay. At each meal Johnny can eat foods having no more than a certain amount of calories. Write a Prolog program to choose foods for Johnny to eat. The goal `pickFoods(AvailableFood,Calories,PossibleMeal)` should unify `PossibleMeal` with a list of foods from the list `AvailableFood`. The sum of energy (calories) in each food in `PossibleMeal` should be no more than `Calories`. Further, it should not be possible to add any food from `AvailableFood` to `PossibleMeal` without exceeding the calorie limit. If a solution to `pickFoods` is rejected another possible meal should be chosen. No food can appear in `PossibleMeal` more than the number of times it appears in `AvailableFood`. Assume that the database already contains facts of the form `food(apple,70).` `food(candyCorn,200).` `food(coke,160).` `food(broccoli,50).` `food(lowFatTwinkie,90).` (34 pts)

For example, consider the following Prolog session transcript:

```
?- pickFoods([candyCorn,apple,coke,broccoli],210,Meal).

Meal = [candyCorn] ;

Meal = [apple,broccoli] ;

Meal = [coke,broccoli] ;

no
```

Problem 2: Write a Prolog program which will find all occurrences of a sublist in a larger list, returning a list of matching locations. The goal `matchList(BigList,LittleList,Locs)` should return all positions in which `LittleList` can be found in `BigList`. For example, consider the following Prolog session transcript: (33 pts)

```
?- matchList([a,b,c,a,b,a],[a,b],L).

L = [1,4]

yes

?- matchList("abracadabra","a",L).

L = [1,4,6,8,11].

yes

?- matchList("abracadabra","poof",L).

L = []

yes
```

Problem 3: Answer each of the questions below.

(*a*) The Prolog database contains the following clauses:

```
h(a).
h(b).
g(X,_,X).
g(X,X,_).
g(_,X,X).
a(q).
a(r).
b(r).
b(q).
c(s).
j(X,X):-!.
j(_,_).
```

For each goal below, show Prolog's output. (17 pts)

```
?- h(X),write(X),fail.
```

```
?- h(X),h(Y),write(got(X,Y)),fail.
```

```
?- a(X),b(Y),c(Z),g(X,Y,Z).
```

```
?- j(X,Y),a(X),b(Y),c(Z),j(Y,Z).
```

(b) An expert system is being considered to help movers position boxes in a moving van. Give at least two reasons why an expert system would be appropriate and why an expert system would not be appropriate for this problem. (16 pts)