CMPE532 Final Exam

Spring 2018

Time: 2 hours.

Closed book, closed notes, closed Internet! Open Eclipse and its documentation.

Implement the following perdicates in Eclipse. Save your answers on a CD, labeled by your name and student number. The answer to each question should be in a different file.

1. A binary tree can be represented in Eclipse in the following way.

   • An empty tree is represented by the atom **empty**.

   • A tree with a left child **l**, right child **r** and node value **v** is represented by **node(l,v,r).**

   height(Tree,H):- …. /* height of the tree is the length of the longest path from the root to a leaf node */ (10 pts)

   howMany(Tree,Value):- …. /* how many times Value occurs in Tree */ (10 pts)

   leafNodes(Tree,List):- … /* List should be bound to the leaf nodes of Tree. A leaf node has no children. For example, node(empty,4,empty) is a leaf node. */ (10 pts)

2.
   a. **odd_positioned(L,N):-** … /* L is a list of values, N is a list obtained from L that has only values in odd positions of L */ (10 pts)
   b. **even_positioned(L,N):-** … /* L is a list of values, N is a list obtained from L that has only values in even positions of L */ (10 pts)
   c. **positions(L,V,P):-** …. /* P is the list of positions at which V occurs in L. e.g. positions([a,b,c,b,s],b,X) should bind X to [2,4] */

3. Assume the Eclipse database contains flight information as below, where the first argument to **flight** is the starting city, the second argument is the destination city, and the third argument is the distance between the two.

   flight(ercan, istanbul, 1200).
   flight(ercan, izmir, 1000).
   flight(izmir,london,2000).
   flight(Istanbul,london,2500).
   …..

Write a program defining the predicate **min_path(Start,End,Path,Distance)** which gives the minimum Distance from city Start to city End city, going through the cities in the list Path. For example, **min_path(ercan,london,P,D)** should bind P to [ercan,izmir,london] and D to 3000. (40 pts)