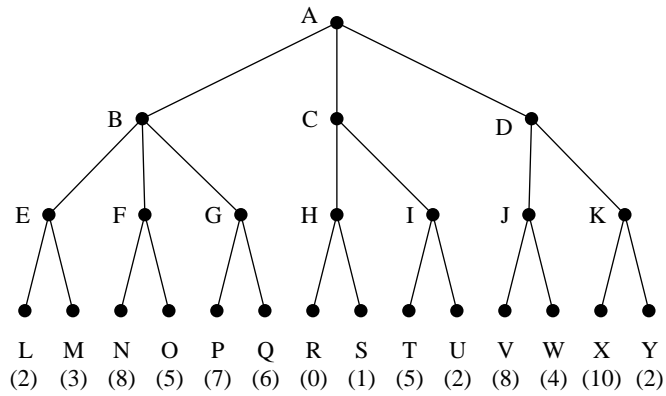# CIS 32 Homework 3

1. Consider the following game tree in which the scores for the leaf nodes are given from the first player's point of view. Assume that the first player is the maximising player.

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   (a) What move should the first player choose?

   (b) What nodes would not need to be examined using the alpha-beta approach, assumingthat nodes are examined from left to right?

   (30 points)

2. Most game-playing programs do not save search results from one move to the next. Instead they usually start over from scratch when it is the machine's turn to move. Why?

   (10 points)

3. (The next two questions refer to the animals rule base given at the end of this assignment.)

   Given the following facts

   ```
   animal gives milk
   animal chews cud
   animal has black stripes
   ```

1

use forward chaining to find out what animal is implied.

Note that I don't just want the answer, what I want is for you to give me all the facts that forward chaining infers.

(10 points)

4. Given the following facts

```
animal can fly
animal lays eggs
animal is good flyer
```

use backward chaining to see if you can prove that the animal is

   (a) An ostrich
   (b) An albatross

Note that I don't just want the answer, what I want is for you to show the proof process that backward chaining goes through.

(20 points)

5. What sets of facts would suffice to establish that an animal was an ostrich?

(10 points)

6. Suppose that we allowed rules with OR connectives in, as well as just AND. What changes would we need to make to our forward and backward chaining algorithms to support these enriched rules? Give pseudo-code for the algorithm.

(20 points)

The Animals Rule Base

```
R1:  IF animal has hair
     THEN animal is a mammal

R2:  IF animal gives milk
     THEN animal is mammal
```

```
R3:  IF animal has feathers
     THEN animal is a bird

R4:  IF animal can fly
     AND animal lays eggs
     THEN animal is bird

R5:  IF animal eats meat
     THEN animal is carnivore

R6:  IF animal has pointed teeth
     AND animal has claws
     THEN animal is carnivore

R7:  IF animal is mammal
     AND animal has hoofs
     THEN animal is ungulate

R8:  IF animal is mammal
     AND animal chews cud
     THEN animal is ungulate

R9:  IF animal is mammal
     AND animal is carnivore
     AND animal has tawney colour
     AND animal has dark spots
     THEN animal is cheetah

R10: IF animal is mammal
     AND animal is carnivore
     AND animal has tawney colour
     AND animal has black stripes
     THEN animal is tiger

R11: IF animal is ungulate
     AND animal has long legs
     AND animal has dark spots
     THEN animal is giraffe
```

```
R12: IF animal is ungulate
     AND animal has black stripes
     THEN animal is zebra

R14: IF animal is bird
     AND animal does not fly
     AND animal has long legs
     AND animal has long neck
     THEN animal is ostrich

R14: IF animal is bird
     AND animal does not fly
     AND animal can swim
     AND animal is black and white
     THEN animal is penguin

R15: IF animal is bird
     AND animal is good flyer
     THEN animal is albatross
```