SOLUTION NOTES

Prolog for Artificial Intelligence 2001 Paper 5 Question 7 (WFC)

(a)
Consider the following query and response:
?- max(3, 1, 1)
yes

The answer is incorrect because 1 is not the maximum of 3 and 1.

(b)

The cause of the error lies in the misunderstanding that the above
program is a translation of the following sentence: The maximum of X,Y
is X if X >= Y, or is Y otherwise. Actually the above program has to
be read as follows: The maximum of X and Y is Z if X=Z and X >= Y, or
is Y otherwise. Obviously this is not the correct definition of the
maximum function. Here, the word "otherwise" means either X != Z or X
< Y. Since 3 != 1, the second clause applies, leading to the answer
that the maximum of 3 and 1 is 1.

In the above program, the cut is intended to substitute the test X < Y
in the second clause by preventing Prolog from using the clause once
the text X >= Y succeeds. However, the cut was not given a chance, as
the goal fails to unify with the head of the first clause.

(c)

The error can be avoided by using one of the following:

```
max(X, Y, X) :- X > Y, !, Z = X.
max(X, Y, Y) :- X < Y.
```

or

```
max(X, Y, X) :- X > Y, !.
max(X, Y, Y) :- X < Y.
```

(d)

```
maxlist([], A, A).
maxlist([H|T], A, Z) :- H >= A, !, maxlist(T, H, Z).
maxlist([H|T], A, Z) :- H < A, maxlist(T, A, Z).
```