

## 32002: Artificial Intelligence Assignment # 2

February 14, 2014

1. Given the propositions  $A, B, C, D$  and rules  $R_1$  to  $R_4$ ,

$$R_1 = \text{if } A \wedge X \wedge Y \text{ then } Z$$
$$R_2 = \text{if } B \wedge V \text{ then } Y$$
$$R_3 = \text{if } C \wedge V \text{ then } X$$
$$R_4 = \text{if } D \text{ then } V$$

- (a) Use the forward-chaining to determine if  $Z$  can be inferred from the above knowledge-base.
  - (b) Use the backward-chaining to determine if goal  $Z$  succeeds from the above knowledge-base.
2. Consider the following piece of knowledge: Tony, Mike, and John belong to the Alpine Club. Every member of the Alpine Club who is not a skier is a mountain climber. Mountain climber do not like rain, and any one who does not like snow is not a skier. Mike dislikes whatever Tony likes and likes whatever Tony dislikes. Tony likes rain and snow. Represent this knowledge as a set of predicate calculus statements appropriate for a backward rule-based deduction system. Show how such a system would answer the question, "Is there a member of the Alpine Club who is a mountain climber but not a skier?"
  3. Given the following facts and rules about a blocks world, represent them in rules forms, then translate the rules into prolog, and find out "what block is on black block?"

**Facts:**

$A$  is on table.

$B$  is on table.

$E$  is on  $B$ .

$C$  is on  $A$ .

$C$  is heavy.

$D$  has top clear.

$E$  has top clear.

$E$  is heavy.

$C$  is iron made.

$D$  is on  $C$ .

**Rules:**

Every big, black block is on a red block.

Every heavy, iron block is big.

All blocks with top clear are black.

All iron made blocks are black.

4. Given the following knowledge base for prolog, find a female descendant of 'george', by manually running the program.

```
ancestor(X,X).
parent(george,sam).
parent(george,andy).
parent(andy,mary).
male(george).
male(sam).
male(andy).
female(mary).
ancestor(X,Z) :- parent(X,Y), ancestor(Y,Z).
```

5. Draw the search trees for the following prolog queries.

- (a)  $?- \text{member}(a, [c, b, a, y])$ .  
(b)  $?- \text{member}(X, [a, b, c])$ .

*Note: Submission deadline 21st Feb. 2013, (Friday) 23:59 hrs (IST). Assignment shall be submitted online only at email id kr.chowdhary at iitj.ac.in, with subject marked as AI-HW2-rollno. Format: pdf, prepared in latex or word.*