CSE4107

Class Test 1, Spring-20XX

Marks: 10 Time: 25 min.

1. Describe two important environment contrasts that are generally considered for designing rational agents. (2)
2. Prove or disprove $\exists x(Mat(x) \wedge Tk(Hab, x))$ from the following knowledgebase using resolution. (3)
   a) Std(Hab)
   b) $Mat(MatFor(y)) \vee \neg Std(y)$
   c) $\neg Std(y) \vee Tk(y, MatFor(y))$
3. Elaborate the concept of Unification? (2)
4. Show that

   $\forall x, y, z ((Br(x, y) \wedge Sn(z, x)) \Rightarrow Nw(z, y))$

   is a syntactically correct sentence of First Order Logic. (3)

---

1. Explain the characteristics of a rational Agent. (2)
2. Convert the following FOL sentence into CNF. (3)

   $\forall x (Std(x) \wedge Tk(x, CSE1203) \leftrightarrow CStd(x))$
3. Why backward chaining algorithms are said to be goal oriented? (2)
4. Prove or disprove the proposition M using a typical forward chaining algorithm on the knowledgebase that follows. (3)

   A, B, C, D, $G \wedge M \Rightarrow H$, $A \wedge H \Rightarrow E$, $C \wedge K \Rightarrow L$, $H \wedge K \Rightarrow S$, $B \wedge F \Rightarrow G$, $B \wedge D \Rightarrow K$,
   $D \wedge F \Rightarrow G$, $D \wedge G \Rightarrow M$, $D \wedge L \Rightarrow H$.

---

1. How is a Term defined in the syntax of First Order Logic? (2)
2. Resolve P2("Bt", "Rt") from the following clauses, considering that the variables are standardized. (3)

   $P1(y, F1(x)) \vee P2(y, u)$

   $\neg P1(\text{"Bt"}, z) \vee P3(u, F2(x))$

   $\neg P3(\text{"Rt"}, v)$
3. Explain the matching rules that are involved during Unification. (2)
4. Derive the most general unifier, if possible, for the following set of FOL sentences. (3)

   S = {P1(F2("Mk"), z, "Bl", u), P1(y, "Rd", x, F3(z))}

---

1. What are the basic components of an Agent? (2)
2. Consider the following situation of 'Find Gold avoiding Monsters' problem.

   $S_{i,j} \Leftrightarrow M_{i-1,j} \vee M_{i+1,j} \vee M_{i,j-1} \vee M_{i,j+1}$ $(i \geq 1) \wedge (j \geq 1) \wedge (i \leq 4) \wedge (j \leq 4)$

   $\neg M_{1,1} \wedge \neg M_{2,1} \wedge S_{2,1} \wedge \neg G_{2,1}$ $A_{2,1}$

   Derive $M_{3,1} \vee M_{2,2}$ using the inference rules of propositional logic. (3)
3. How Resolution is used to prove or disprove a sentence? (2)
4. Convert the following English sentence to CNF of FOL. (3)

   A student of the department of EEE must take EEE1101 and PHY1201.