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National Institute of Technology Hamirpur  
End Semester Examination, Odd Sem, AY 2022-23  
Artificial Intelligence (CS-411)

Time: 2.30 PM to 5.30 PM

Date: 02-12-2022

Duration: 3 hours

Max. Marks = 50

Note 1: Attempt all questions from 1 to 5.

Note 2: If required to solve a question, make & and state your assumptions clearly.

1. [2 + 4 + 4 = 10]

- (a) Differentiate between procedural and declarative knowledge using examples.
- (b) Write the equivalent Prolog formulas for the following:  
 $\forall x: \neg \text{tasty}(x) \vee \neg \text{edible}(x) \vee \text{food}(x)$   
 $\forall x: \text{pigeon}(x) \wedge \text{sparrow}(x) \implies \text{bird}(x)$   
 How would you represent the following in Prolog?  
 $\forall x: \text{dog}(x) \implies \neg \text{tiger}(x)$
- (c) In many situations, search is possible in both forward and backward directions. Discuss the factors that help us to decide whether forward search or backward search should be chosen.

2. [5 + 5 = 10]

- (a) What do you understand by semantic networks and partitioned semantic networks? Explain using suitable examples. Draw the partitioned semantic network for the sentence:  
Every thief in the village has stolen from the house
- (b) What is intersection search in relation to semantic networks? Give an example. What are Frames? Discuss the conflict when considering frames as sets and instances.

3. [6 + 4 = 10]

- (a) Consider the following axioms:
  1. Every child loves every candy.
  2. Anyone who loves some candy is not a nutrition fanatic.
  3. Anyone who eats any pumpkin is a nutrition fanatic.
  4. Anyone who buys any pumpkin either carves it or eats it.
  5. John buys a pumpkin.
  6. Lifesavers is a candy.
  7. (Conclusion) If John is a child, then John carves some pumpkin.
 Prove the above using resolution. Show all the steps including conversion to clause form.
- (b) Explain conflict resolution in relation to rule matching. When does the conflict arises? Discuss the strategies used to resolve such conflicts.

4. [5 + 5 = 10]

- (a) Discuss 5 problem characteristics that influence the design of solutions to AI problems.
- (b) Solve the following constraint satisfaction problem  
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5. [4 + 6 = 10]

- (a) What is agenda search? How is it different from other heuristic techniques? What are the types of problems in which agenda search will be useful and in which cases it will not be useful? Why?
- (b) What are the desirable properties of a knowledge representation system? What are the different types of knowledge that are required to be represented while developing AI solutions? Give examples of each.