CS 462/570: Final exam questions

On the exam, there will be two questions from this list, and two "practical" problems to be announced in class.

1. Explain different views on AI: systems that think like humans; systems that act like humans; systems that think rationally; systems that act rationally. Having learned so much about AI this semester, which of these views is the closest to your understanding of the subject and why? Give an example of an AI application consistent with your point of view, discuss it in detail to justify your definition of AI.

2. What is an intelligent agent? Describe different components of an AI agent and explain differences between simple reflex agents, agents with an internal model of the world, goal- based agents, and utility-based agents. What is a difference between a performance measure and a utility function?

3. Define a problem-solving agent utilizing search. How a search problem is defined? What types of searches you know (must include all covered in class)? Compare them in the view of the types of problems that they are best suited for?

4. Define a knowledge-based agent and describe its major components. What is knowledge representation? What KR formalisms do you know-- explain and compare them (including but not limited to PL, FOL, DLs).

5. Define the notions of entailment and inference: how are they related? Explain how to prove the validity of a PL sentence. Give an example. What is the difference between a model and an interpretation? Compare truth-tables method to Wang’s algorithm.

6. What are the inference rules of PL? Explain their properties, and comment on the complexity of propositional inference. What are the weaknesses of PL from the KR point of view?

7. Explain (in detail) and compare forward and backward chaining algorithms. Give examples.

8. What is knowledge engineering? Explain the difference between shallow knowledge and deep knowledge, and rule-based systems and model-based systems respectively.

9. Define the syntax and semantics of FOL. Explain FOL inference procedure and discuss its complexity. Why is FOL semi-decidable?

10. Explain the generalized Modus Ponens and how it is used in forward and backward chaining algorithm. Discuss the completeness of chaining algorithms.

11. What is a canonical form of FOL formulas? Explain the process of converting a set of FOL formulas to a normal form.

12. Explain the resolution method and give an example to illustrate how it works. Is it complete? If not, how to extend it, to make it complete. Explain the refutation method.

13. How Description Logics are different from FOL – explain, give an example and compare the two representations. Define the syntax and semantics of ALC and discuss the tableaux algorithm.

14. Building ontologies – compare different knowledge representation formalism (PL, FOL, DLs, Semantic nets, and PROLOG) in terms of their descriptive and inferential power.

15. How FOL can be expanded to represent and handle assumptions? Explain PROLOG negation as failure rule and default rules in default logic. Compare default reasoning and logic (PL, FOL) reasoning.