

Artificial Intelligence Foundations and Applications (AI61005)

Class Test 2 (Sept 27, 2021)

Time: 1 hour. Total Marks:40

Answer ALL Questions

(Write answers in paper with your name, roll number and signature in every page. Answer each question in a separate page. Upload in the Google Form provided – Answer to each Question is to be uploaded as a separate pdf file, totaling three file submissions.)

1. Answer all the parts:

- a) What is meant by a deduction system being sound and complete?
- b) Prove that Resolution Refutation for Propositional Logic is sound and complete.
- c) How would you argue that Resolution Refutation for Predicate Logic is sound but not complete?

[4 + 4 + 4 = 12 marks]

2. Consider the following problem statements to be coded in propositional logic and solved using either the three method or resolution refutation method:

Swapna either wrote on paper or typed the answers for the examination. If she wrote on paper or did not have a camera, she could not complete in time. Swapna could not complete in time. So she wrote on paper.

Answer the following questions:

- a) List all propositions that you will use for encoding the problem.
- b) Code the sentences and goal in propositional logic using the propositions defined in (a).
- c) Prove using tree method or resolution refutation, whether the conclusion (last sentence) can be derived from the given facts (first three sentences) and justify your answer clearly.

[2 + 4 + 4 = 10 marks]

3. Consider the following problem statements to be coded in first order predicate logic and solved using resolution refutation method:

There is a question which is answered by every candidate who answers at least one question. Every candidate answers some question. Therefore, there is a question which is answered by all candidates.

Answer the following questions:

- a) List all predicates that you will use for encoding the problem.
- b) Code the sentences and goal in first order predicate calculus using the predicates defined in (a).
- c) Convert each of them to Clausal Form and List the Clauses.
- d) Use Resolution Refutation Method to show whether the goal can be logically concluded from the facts or not. Clearly show the method and all derived clauses.

[2 + 6 + 4 + 6 = 18 marks]