

CS717: Midsem

15 Marks, Closed book

1. Find a model for $\Sigma = \{C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8\}$ where:

$$\begin{aligned}C_1: & A \vee B \\C_2: & \neg A \vee \neg B \\C_3: & A \vee \neg C \\C_4: & C \vee D \vee E \\C_5: & D \vee \neg E \\C_6: & \neg D \vee \neg F \\C_7: & F \vee E \\C_8: & \neg F \vee \neg E\end{aligned}$$

2.5 Marks

2. Prove/disprove the following for definite programs Σ_1 and Σ_2 :

$$MM(\Sigma_1 \cup \Sigma_2) \equiv MM(\Sigma_1) \cup MM(\Sigma_2)$$

2 Marks

3. Can the Davis Putnam procedure (DPLL) be made to perform faster on Horn Clauses? How about polynomial time?

2 Marks

4. Which of these formulas are semantically equivalent to $(q \vee r) \leftarrow p$?

- (a) $p \leftarrow (\neg r \wedge q)$
- (b) $q \leftarrow (\neg r \wedge p)$
- (c) $\neg p \leftarrow (\neg r \wedge \neg q)$

3 Marks

5. Prove the model intersection property without using induction. *Hint:* Consider whether some ground clause $(q \leftarrow \text{body})$ can be made false in the intersection of its models.

2 Marks

6. Prove that a partially ordered set $\langle S, \preceq \rangle$ has a unique greatest element if every subset s of S has a greatest lower bound.

1.5 Marks

7. Construct an informal (model-based) argument which shows that the sentences $(A \leftarrow B) \leftarrow C$ and $A \leftarrow (B \wedge C)$ have the same values in any interpretation.

2 Marks