Midterm Exam: Version W

Instructions: (1) Read over the entire exam before you begin. (2) You have 50 minutes to complete the exam. (3) Write your answers in the exam booklet. (4) Write your name, pledge, **exam version** and **preceptor's name** on the exam booklet. (5) When you are finished, place your exam booklet in the box at the back of the room and leave quietly. [There are 34 total possible points.]

Definitions

Complete the following sentences. [2 points each]

1. An argument with premises $A_1, \ldots, A_n$ and conclusion B is *invalid* if …

2. Sentence A is *contingent* if …

Translation

Translate the following English sentences into propositional logic. You may use the suggested propositional variables for elementary sentences. [2 points each]

1. Rosamond loves Lydgate only if he is not in debt. (L, D)

2. Ladislaw loves Dodo, but if she marries him she will lose her income. (L, M, I)

3. Dodo doesn't love Casaubon, and neither does she respect him. (L, R)

Proofs

Give formal proofs of the following arguments. You may use any of the basic rules of inference. You may also use TI and SI *only if you prove the relevant sequents in your exam booklet*. You may *not* solve these problems by writing truth tables and citing completeness. [4 points each]

1. $R \rightarrow -(P \rightarrow Q) \vdash -Q \vee -R$
2. $\vdash ((P \rightarrow Q) \& (-P \rightarrow Q)) \rightarrow Q$

Semantics

1. Is the following argument valid? Explain your answer. [4 points]

$$(S \vee R)\&(Q \vee P) \quad \overset{?}{\models} \quad ((-Q \vee -R)\&(-Q \vee -S)) \rightarrow ((P\&R) \vee (Q\&S))$$

2. True or false (explain your answer): If $A \rightarrow B$ is contingent, then B is contingent. [4 points]

3. Give a sentence that contains only $\vee, -, P, Q$ and that is logically equivalent to $-(P \leftrightarrow Q)$. (Note: Your sentence should *not* contain &.) [4 points]

Soundness and Completeness

1. True or False: There could be a correctly written proof with the following line fragments. (How do you know?) [4 points]

$$1 \quad (1) \quad -(((P \rightarrow Q) \rightarrow P) \rightarrow P)$$
$$\vdots$$
$$1 \quad (n) \quad R\& - R$$

THE END