III. Use the first thirteen rules of inference to derive the conclusions of the following symbolized arguments.

★(1) 1. $(\sim M \supset P) \cdot (\sim N \supset Q)$
2. $\sim(M \cdot N)$ / $P \vee Q$

(2) 1. $\sim S$ / $\sim(F \cdot S)$

(3) 1. $J \vee (K \cdot L)$
2. $\sim K$ / J

★(4) 1. $\sim(N \cdot T)$
2. T / $\sim N$

(5) 1. $H \supset \sim A$
2. A / $\sim(H \vee \sim A)$

(6) 1. $R \supset \sim B$
2. $D \vee R$
3. B / D

★(7) 1. $T \supset (B \vee E)$
2. $\sim E \cdot T$ / B

(8) 1. $(O \vee M) \supset S$
2. $\sim S$ / $\sim M$

(9) 1. $Q \vee (L \vee C)$
2. $\sim C$ / $L \vee Q$

★(10) 1. $(K \cdot H) \vee (K \cdot L)$
2. $\sim L$ / H

(11) 1. $\sim(\sim E \cdot \sim N) \supset T$
2. $G \supset (N \vee E)$ / $G \supset T$

(12) 1. $H \cdot (C \cdot T)$
2. $\sim(\sim F \cdot T)$ / F

★(13) 1. $(E \cdot I) \vee (M \cdot U)$
2. $\sim E$ / $\sim(E \vee \sim M)$

(14) 1. $\sim(J \vee K)$
2. $B \supset K$
3. $S \supset B$ / $\sim S \cdot \sim J$

(15) 1. $(G \cdot H) \vee (M \cdot G)$
2. $G \supset (T \cdot A)$ / A

★(16) 1. $(Q \cdot N) \vee (N \cdot T)$
2. $(Q \vee C) \supset \sim N$ / T

(17) 1. $\sim(U \vee R)$
2. $(\sim R \vee N) \supset (P \cdot H)$
3. $Q \supset \sim H$ / $\sim Q$

(18) 1. $\sim(F \cdot A)$
2. $\sim(L \vee \sim A)$
3. $D \supset (F \vee L)$ / $\sim D$

★(19) 1. $[(I \vee M) \vee G] \supset \sim G$
2. $M \vee G$ / M

(20) 1. $E \supset \sim B$
2. $U \supset \sim C$
3. $\sim(\sim E \cdot \sim U)$ / $\sim(B \cdot C)$

IV. Translate the following arguments into symbolic form and use the first thirteen rules of inference to derive the conclusion of each. Use the translation letters in the order in which they are listed.

★1. Either health care costs are skyrocketing and they are attributable to greedy doctors, or health care costs are skyrocketing and they are attributable to greedy hospitals. If health care costs are skyrocketing, then both the government should intercede and health care may have to be rationed. Therefore, health care costs are skyrocketing and health care may have to be rationed. (*S, D, H, I, R*)

2. Either the ancient Etruscans were experienced city planners and they invented the art of writing or they were highly skilled engineers and they invented the art of writing. If the ancient Etruscans were bloodthirsty numskulls (as scholars once thought), they did not invent the art of writing. Therefore, the ancient Etruscans were not bloodthirsty numskulls (as scholars once thought). (*C, I, H, B*)

5. Protein engineering will prove to be as successful as genetic engineering, and new enzymes will be developed for producing food and breaking down industrial wastes. If protein engineering proves to be as successful as genetic engineering and new enzymes are developed for breaking down industrial wastes, then it is not the case that new enzymes will be developed for producing food but not medicines. Therefore, protein engineering will prove to be as successful as genetic engineering and new enzymes will be developed for producing medicines. (*E, P, B, M*)

7.4 III

10:26

III. Use the eighteen rules of inference to derive the conclusions of the following symbolized arguments.

(6) 1. $F \supset B$
2. $B \supset (B \supset J)$ / $F \supset J$

★(7) 1. $(B \supset M) \cdot (D \supset M)$
2. $B \vee D$ / M

6-20

(8) 1. $Q \supset (F \supset A)$
2. $R \supset (A \supset F)$
3. $Q \cdot R$ / $F \equiv A$

(9) 1. $T \supset (\sim T \vee G)$
2. $\sim G$ / $\sim T$

★(10) 1. $(B \supset G) \cdot (F \supset N)$
2. $\sim (G \cdot N)$ / $\sim (B \cdot F)$

(11) 1. $(J \cdot R) \supset H$
2. $(R \supset H) \supset M$
3. $\sim (P \vee \sim J)$ / $M \cdot \sim P$

(12) 1. T / $S \supset T$

★(13) 1. $K \supset (B \supset \sim M)$
2. $D \supset (K \cdot M)$ / $D \supset \sim B$

(14) 1. $(O \supset C) \cdot (\sim S \supset \sim D)$
2. $(E \supset D) \cdot (\sim E \supset \sim C)$ / $O \supset S$

(15) 1. $\sim (U \cdot W) \supset X$
2. $U \supset \sim U$ / $\sim (U \vee \sim X)$

★(16) 1. $T \supset R$
2. $T \supset \sim R$ / $\sim T$

(17) 1. $S \vee \sim N$
2. $\sim S \vee Q$ / $N \supset Q$

(18) 1. $M \supset (U \supset H)$
2. $(H \vee \sim U) \supset F$ / $M \supset F$

★(19) 1. $\sim R \vee P$
2. $R \vee \sim P$ / $R \equiv P$

(20) 1. $\sim H \supset B$
2. $\sim H \supset D$
3. $\sim (B \cdot D)$ / H