

EXEM
 Prove the invalidity of each of the following by the method of assigning truth values.

*1. $A \supset B$

$C \supset D$

$A \vee D$

$\therefore B \vee C$

3. $I \vee \sim J$

$\sim(\sim K \bullet L)$

$\sim(\sim I \bullet \sim L)$

$\therefore \sim J \supset K$

2. $\sim(E \bullet F)$

$(\sim E \bullet \sim F) \supset (G \bullet H)$

$H \supset G$

$\therefore G$

4. $M \supset (N \vee O)$

$N \supset (P \vee Q)$

$Q \supset R$

$\sim(R \vee P)$

$\therefore \sim M$

6. $A \equiv (B \vee C)$

$B \equiv (C \vee A)$

$C \equiv (A \vee B)$

$\sim A$

$\therefore B \vee C$

*5. $S \supset (T \supset U)$

$V \supset (W \supset X)$

$T \supset (V \bullet W)$

$\sim(T \bullet X)$

$\therefore S \equiv U$

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$$\begin{aligned}
 7. & D \supset (E \vee F) \\
 & G \supset (H \vee I) \\
 & \sim E \supset (I \vee J) \\
 & (I \supset G) \cdot (\sim H \supset \sim G) \\
 & \sim J \\
 & \therefore D \supset (G \vee I)
 \end{aligned}$$

$$\begin{aligned}
 9. & (S \supset T) \cdot (T \supset S) \\
 & (U \cdot T) \vee (\sim T \cdot \sim U) \\
 & (U \vee V) \vee (S \vee T) \\
 & \sim U \supset (W \cdot X) \\
 & (V \supset \sim S) \cdot (\sim V \supset \sim Y) \\
 & X \supset (\sim Y \supset \sim X) \\
 & (U \vee S) \cdot (V \vee Z) \\
 & \therefore X \cdot Z
 \end{aligned}$$

$$\begin{aligned}
 11. & \sim A \vee B \\
 & C \supset A \\
 & \sim B \vee C \\
 & \therefore \sim(B \cdot A)
 \end{aligned}$$

$$\begin{aligned}
 13. & \sim(\sim S \cdot \sim T) \\
 & \sim S \cdot \sim U \\
 & (V \vee T) \\
 & \therefore \sim(V \supset U)
 \end{aligned}$$

$$\begin{aligned}
 *15. & E \vee (F \cdot \sim G) \\
 & G \supset (E \cdot F) \\
 & G \\
 & \therefore (F \cdot G) \supset \sim(E \cdot F)
 \end{aligned}$$

$$\begin{aligned}
 17. & B \equiv C \\
 & \sim D \equiv \sim C \\
 & D \supset (E \vee F) \\
 & \sim E \\
 & \therefore \sim F
 \end{aligned}$$

$$\begin{aligned}
 19. & A \supset (B \vee C) \\
 & \sim D \supset (\sim B \cdot \sim C) \\
 & \sim D \vee (E \equiv F) \\
 & \therefore \sim F \supset E
 \end{aligned}$$

$$\begin{aligned}
 8. & K \supset (L \cdot M) \\
 & (L \supset N) \vee \sim K \\
 & O \supset (P \vee \sim N) \\
 & (\sim P \vee Q) \cdot \sim Q \\
 & (R \vee \sim P) \vee \sim M \\
 & \therefore K \supset R
 \end{aligned}$$

$$\begin{aligned}
 *10. & A \supset (B \supset \sim C) \\
 & (D \supset B) \cdot (E \supset A) \\
 & F \vee C \\
 & G \supset \sim H \\
 & (I \supset G) \cdot (H \supset J) \\
 & I \equiv \sim D \\
 & (B \supset H) \cdot (\sim H \supset D) \\
 & \therefore E \equiv F
 \end{aligned}$$

$$\begin{aligned}
 12. & M \equiv P \\
 & N \supset O \\
 & \sim(\sim O \vee M) \\
 & \therefore N \supset P
 \end{aligned}$$

$$\begin{aligned}
 14. & Q \equiv (\sim R \vee S) \\
 & \sim R \supset (S \cdot T) \\
 & T \vee \sim(S \cdot T) \\
 & Q \supset (R \vee S) \\
 & \sim(T \vee Q) \\
 & \therefore (S \cdot R) \equiv \sim(T \cdot Q)
 \end{aligned}$$

$$\begin{aligned}
 16. & (A \cdot B) \supset C \\
 & (C \vee D) \supset E \\
 & F \supset A \\
 & F \supset B \\
 & F
 \end{aligned}$$

$$\therefore \sim E$$

$$\begin{aligned}
 18. & A \supset B \\
 & B \supset C \\
 & C \supset D \\
 & D \supset E \\
 & \therefore A \cdot \sim E
 \end{aligned}$$

$$\begin{aligned}
 *20. & E \supset (W \vee P) \\
 & (W \supset O) \cdot (P \supset D) \\
 & T \supset E \\
 & G \supset \sim H \\
 & \sim O \cdot \sim D \\
 & \therefore T
 \end{aligned}$$