

Q-17

(a) The given formula is unsatisfiable. The unsatisfiability is proved using the resolution proof below.

(b) The clauses are

① $P \vee Q \vee R$

② $\neg Q \vee R$

③ $Q \vee \neg R$

④ $\neg P \vee \neg Q \vee \neg R$

⑤ $\neg Q$

⑥ $\neg P \vee Q \vee R$

Using resolution.

$$\frac{P \vee Q \vee R \text{ ①} \quad \neg Q \text{ ⑤}}{P \vee R \text{ ⑦}}$$

$$\frac{P \vee R \text{ ⑦} \quad \neg P \vee Q \vee R \text{ ⑥}}{Q \vee R \text{ ⑧}}$$

$$Q \vee R \text{ ⑧}$$

$$Q \vee \neg R \text{ ③}$$

$$Q \text{ ⑨}$$

$$\neg Q \text{ ⑤}$$

$$\perp \equiv \text{False} \equiv \emptyset$$

Thus unsatisfiable.