(10) **Boole's Inequality :-**

$$P\left(\bigcup_{i=1}^{n} E_i\right) \leq \sum_{i=1}^{n} P(E_i)$$

$$\because \sum_{i=1}^{n} P(E_i) = 1$$

$$\because P\left(\bigcup_{i=1}^{n} E_i\right) = P(E_1 \cup E_2 \cup E_3 \ldots \cup E_n)$$

$$= 1 - P((E_1 \cup E_2 \cup E_3 \ldots \cup E_n)^c)$$

$$= \sum_{i=1}^{n} P(E_i) - \underbrace{P((E_1 \cup E_2 \cup E_3 \ldots \cup E_n)^c)}_{\text{This has some value}}$$

$$\therefore \boxed{P\left(\bigcup_{i=1}^{n} E_i\right) \leq \sum_{i=1}^{n} P(E_i)}$$

Hence proved