

16. \therefore Given:- $E = EF \cup EF^c$

$$E \cup F = E \cup FE^c$$

$$\therefore P(E) = P(EF \cup EF^c) = P(EF) + P(EF^c) \quad (\because \text{they are mutually exclusive})$$

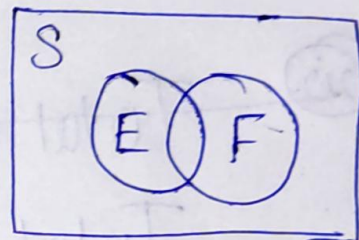
$$\therefore P(F) = P(FE \cup FE^c) = P(FE) + P(FE^c) \quad (\quad \quad \quad)$$

$$\therefore P(E \cup F) = P(E \cup FE^c) = P(E) + P(FE^c) \quad (\quad \quad \quad)$$

∴ We have to prove:-

$$P(E \cup F) = P(E) + P(F) - P(E \cap F)$$

$$\Rightarrow P(E \cap F) = P(E) + P(F) - P(E \cup F)$$



From R.H.S:-

$$P(E) + P(F) - P(E \cup F)$$

$$= P(EF) + P(EF') + P(FE) + \cancel{P(FE')} - \cancel{P(E)} - \cancel{P(FE')}$$

$$= \cancel{P(E)} + 2P(EF) + 2P(FE') + P(EF')$$

$$= 2P(EF) + P(EF') - P(E)$$

$$= 2P(EF) + P(EF') - [P(EF) + P(EF')]$$

$$= 2P(EF) + \cancel{P(EF')} - P(EF) - \cancel{P(EF')}$$

$$= P(EF) = \underline{\text{L.H.S}} \quad \underline{\text{Hence proved}}$$