

$$(4) \text{ Given, } 2P(A) = P(B) = \frac{5}{13} \text{ and } P(A|B) = \frac{2}{5}.$$

$$2P(A) = \frac{5}{13} \Rightarrow P(A) = \frac{5}{26},$$

$$P(B) = \frac{5}{13}.$$

$$\text{Also, } P(A|B) = \frac{P(A \cap B)}{P(B)} \Rightarrow \frac{2}{5} = \frac{P(A \cap B)}{5/13}.$$

$$\therefore P(A \cap B) = \frac{2}{5} \times \frac{5}{13} = \frac{2}{13}.$$

$$\text{Hence, } P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= \frac{5}{26} + \frac{5}{13} - \frac{2}{13}$$

$$= \frac{5+10-4}{26} = \frac{11}{26}.$$