

$$\begin{aligned}
 \text{Ans) } P(L) &= P(L|S)P(S) + P(L|\neg S)P(\neg S) \\
 &= 0.7 \times 0.25 + 0.3 \times (1 - 0.25) \\
 &= 0.4
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } P(W_e) &= P(W_e | L, W_0) P(L) + P(W_e | \neg L, \neg W_0) P(\neg L) + P(W_e | \neg L, W_0) P(\neg L) P(W_0 | \neg L) + P(W_e | \neg L, \neg W_0) P(\neg L) P(\neg W_0 | \neg L) \\
 &= 0.12 \times 0.7 \times 0.4 + 0.25 \times (1 - 0.7) \times 0.4 + 0.1 \times 0.2 \times (1 - 0.4) + 0.08 \times (1 - 0.2) \times (1 - 0.4) \\
 &= 0.114
 \end{aligned}$$

$$(c) P(m|s) = \frac{P(m,s)}{P(s)}$$

$$P(M|S) = \frac{P(M,S)}{P(S)} = \frac{0.08135}{0.25} = 0.365$$

$$(d) P(B|S) = \frac{P(B, S)}{P(S)}$$

$$\begin{aligned}
 P(B, S) &= P(B, S, W_0, R) + P(B, S, \neg W_0, R) + P(B, S, \neg W_0, \neg R) \\
 &= P(B|S, W_0)P(W_0|R)P(R|S)P(S) + P(B|S, \neg W_0)P(\neg W_0|R)P(R|S)P(S) + P(B|S, \neg W_0)P(\neg W_0|\neg R)P(\neg R|S)P(S) \\
 &= 0.8 \times 0.7 \times 0.25 + 0.4 \times (1 - 0.7) \times 0.7 \times 0.25 + 0.4 \times (1 - 0.2) \times (1 - 0.7) \times 0.25 \\
 &= 0.155
 \end{aligned}$$

$$P(B|S) = \frac{P(B, S)}{P(S)} = \frac{0.155}{0.25} = 0.620$$

$$(e) P(S|B, \gamma w_0) = \frac{P(S, B, \gamma w_0)}{P(B, \gamma w_0)}$$

$$\begin{aligned}
 P(S, B, \neg W_0) &= P(S, B, \neg W_0, R) + P(S, B, \neg W_0, \neg R) \\
 &= 0.4 \times (1 - 0.7) \times 0.7 \times 0.25 + 0.4 \times (1 - 0.2) \times (1 - 0.7) \times 0.25 \quad (\text{from d}) \\
 &= 0.045
 \end{aligned}$$

$$\begin{aligned}
 P(B \cap W_0) &= P(B \cap W_0 \cap R, S) + P(B \cap W_0 \cap R, \neg S) + P(B \cap W_0 \cap \neg R, S) + P(B \cap W_0 \cap \neg R, \neg S) \\
 &= 0.4 \times (1 - 0.7) \times 0.7 \times 0.25 + 0.4 \times (1 - 0.2) \times (1 - 0.7) \times 0.25 + P(B \cap S, \neg W_0 \cap R) P(\neg W_0 \cap R \cap S) + P(B \cap \neg S, \neg W_0 \cap R) P(\neg W_0 \cap R \cap \neg S) \\
 &= 0.4 \times (1 - 0.7) \times 0.7 \times 0.25 + 0.4 \times (1 - 0.2) \times (1 - 0.7) \times 0.3 \times (1 - 0.25) + 0.4 \times (1 - 0.2) \times (1 - 0.7) \times 0.3 \times (1 - 0.25) \\
 &= 0.2400
 \end{aligned}$$

$$P(S|B_1 \wedge w_0) = \frac{P(S, B_1 \wedge w_0)}{P(B_1 \wedge w_0)} = \frac{0.045}{0.24} = 0.187$$