CE 204 UNCERTAINT and DATA ANALYSIS
Homework 1 - Answer

2) Given: $P(E)=0{,}0012$, $P(L)=0{,}0022$, $P(T)=0{,}0018$

$P(L/E)=0{,}1$

T is indep. of E and L.

a) $P(ELT)=P(EL)\,P(T)=P(L/E).P(E).P(T)$

$=0{,}1\times 0{,}0012\times 0{,}0018=0{,}216\times 10^{-6}$

b) $P(E\cup L\cup T)=1-\overline{P(E\cup L\cup T)}=1-P(\bar{E}\bar{L}\bar{T})=1-P(\bar{E}\bar{L}).P(\bar{T})$ (1)

$P(\bar{E}\bar{L})=1-\overline{P(\bar{E}\bar{L})}=1-P(E\cup L)=1-[P(E)+P(L)-P(EL)]$

$=1-[0{,}0012+0{,}0022-\underbrace{P(L/E).P(E)}_{0{,}1\times 0{,}0012}]$

$=0{,}99672 \longrightarrow$ substitute into (1)

$P(E\cup L\cup T)=1-0{,}99672(1-0{,}0018)\cong 0{,}0050741$

OR

$P(E\cup L\cup T)=P(E)+P(L)+P(T)-P(EL)-P(ET)-P(LT)+P(ELT)$

$=0{,}0012+0{,}0022+0{,}0018-0{,}1\times 0{,}0012$

$-0{,}0012\times 0{,}0018-0{,}0022\times 0{,}0018$

$+0{,}216\times 10^{-6}\cong 0{,}0050741$

c) $P(E/_{E\cup L\cup T})=\dfrac{P(E(E\cup L\cup T))}{P(E\cup L\cup T)}=\dfrac{P(E)}{0{,}0050741}=0{,}2365$

3) Given: $P(H) = 1/12$, $P(M) = 3/12$, $P(L) = 8/12$

R : Reliability

$P(R/L) = 0{,}995$

$P(\bar{R}/M) = 2 \times (1 - 0{,}995) = 0{,}01$

$P(\bar{R}/H) = 10 \times (1 - 0{,}995) = 0{,}05$

a) $P(R) = P(R/L).P(L) + P(R/M).P(M) + P(R/H).P(H)$

$= 0{,}995 \times \frac{8}{12} + (1 - 0{,}01) \times \frac{3}{12} + (1 - 0{,}05) \times \frac{1}{12}$

$= 0{,}99$

b) $P(H) = 0 \implies P(M) = 3/11$, $P(L) = 8/11$

$P(R) = P(R/M).P(M) + P(R/L).P(L)$

$= (1 - 0{,}01) \times \frac{3}{11} + (1 - 0{,}05) \times \frac{8}{11} \doteq 0{,}961$

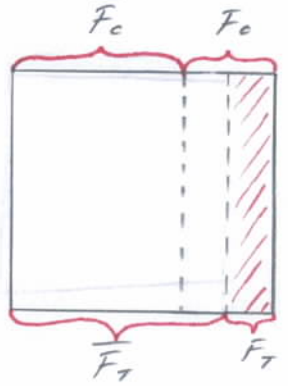
c) $P(M/\bar{R}) = \dfrac{P(\bar{R}/M).P(M)}{P(\bar{R})} = \dfrac{2 \times (1 - 0{,}995) \times 3/11}{(1 - 0{,}961)} = 0{,}06993$

$P(L/\bar{R}) = \dfrac{P(\bar{R}/L).P(L)}{P(\bar{R})} = \dfrac{0{,}05 \times 8/11}{(1 - 0{,}961)} = 0{,}9324$

4) Given: $P(F_c) = 0{,}0012$, $P(F_T / F_c) = 0{,}018$

Where F_c : Commencement fails

F_T : Termination fails



$P(\bar{F}_c \bar{F}_T / F_c F_T) = \dfrac{P(\emptyset)}{P(F_c F_T)} = 0$

$F_c F_T \cap \bar{F}_c \bar{F}_T = \emptyset$