Task 24:-

Bayes rule

prior probability before the test · test evidence → posterior

prior: $P(C) = 0.01$ → $P(\neg C) = 0.99$

$P(Pos/C) = 0.9$

$P(\neg Pos/\neg C) = 0.9$ → $P(Pos/\neg C) = 0.1$

Posterior: $P(C/Pos) = P(C) \cdot P(Pos/C)$ → $\frac{9}{1000}$

Joint $P(\neg C/Pos) = P(\neg C) \cdot P(Pos/\neg C)$ → $\frac{99}{1000}$

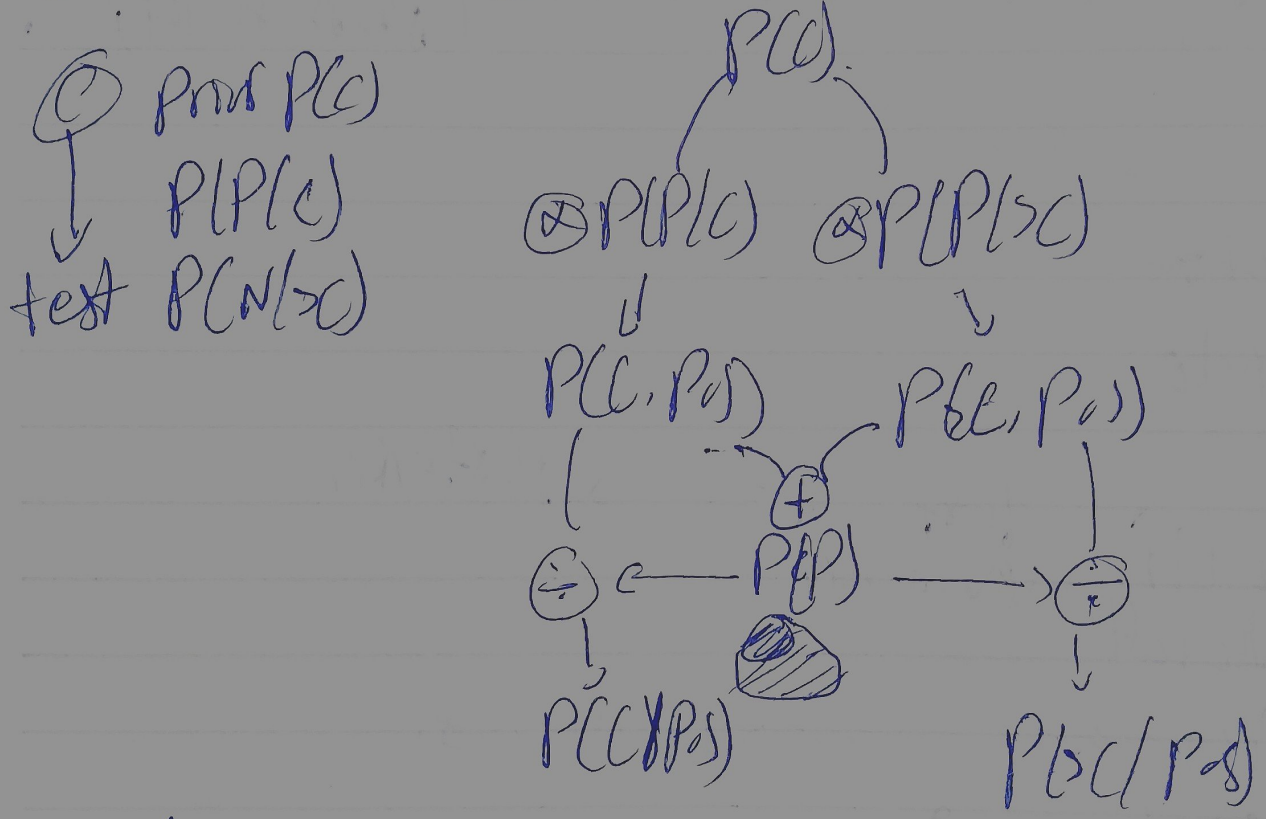
normalizer $\Rightarrow P(P_{os}) = P(C, P_{os}) + P(\bar{C}, P_{os}) = 0.108$

Posterior $\Rightarrow P(C/P_{os}) = \frac{0.009}{0.108} = 0.0833$

$P(\neg C/P_{os}) = \frac{0.092}{0.108} = 0.9167$

$\boxed{P(A) = 1}$

Bayes rule summary:-



robot sensing:

$P(R) = P(G) = 0.5$

$P(\text{see } R/\text{at } R) = 0.8$

$P(\text{see } G/\text{at } G) = 0.8$

$P(\text{at } R/\text{see } R) = ?$

$P(\text{at } G/\text{see } R) = ?$

$\frac{0.8 \times 0.5}{0.5} = 0.8$

$\} = 0.2$

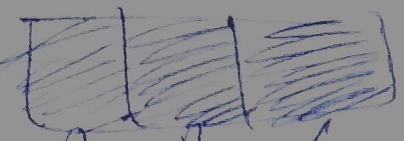
$P(+) = 0.8 \times 0.5 + 0.2 \times 0.5$

$= 0.5$

see Red

$P(A) = P(B) = P(C) = 0.333$

Robot sees R



$P(R/A) = 0.9$

$P(R/B) = 0.9 \rightarrow$ 0.1

$P(R/C) = 0.9 \rightarrow$ 0.1

$P(A,R) = 0.9 \times \frac{1}{3} = \boxed{0.3}$

$P(B,R) = 0.0333$

$P(C,R) = 0.0333$

$\boxed{P(R) = 0.3667}$

$P(A/R) = 0.818 \quad P(B/R) = 0.091 \quad P(C/R) = 0.091$

$\boxed{\Sigma = 1}$