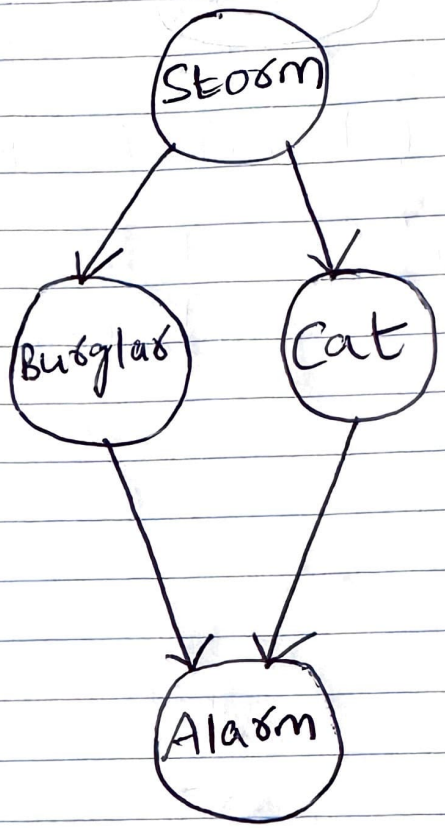
Chapter 6, Exercise 4

(a)



(b) From Table: $p(storm=T) = 0.3077$

S	P(Burglar=T|S)
T	0.25
F	0.33

S	P(Cat=T|S)
T	0.75
F	0.222

Burglar	Cat	P(Burglar=T|S
T	T	1
T	F	0.667
F	T	0.25
F	F	0.2

(c.) When Burglar = true and Cat = True, the conditional probability table reveals that ALARM = true is the MAP prediction.

(d.) $$P\left(\frac{a}{s}\right) = \frac{P\left(\frac{a}{s}\right)}{P(s)} = \Sigma \frac{P(a,B,C,S)}{P(S)}$$

$$= \Sigma P(a,B,C,S) = \Sigma P(a \setminus B,C) \cdot P\left(\frac{b}{s}\right) \cdot P(C \setminus S) \cdot P(S)$$

$$= \left[(1.08)(0.25)(810)(0.75)(0.30777)\right]$$

$$+ \left[(0.667)(0.25)(0.25)(0.377)\right]$$

$$+ \left[(0.25)(0.75)(0.75)(0.3077\right]$$

$$+ \left[(0.2)(0.75)(0.25)(0.3077)\right]$$

$$= 0.125324$$

$$P\left(\frac{a}{s}\right) = \frac{P\left(\frac{a}{s}\right)}{P(s)} = \frac{0.125324}{0.3077} = \boxed{0.4073}$$

$$\Rightarrow P(\text{ALARM}=\text{FALSE}) = 0.5927$$

So in this instance, ALARM = false is the MAP prediction.