Mona Jalal

1)

x	y	z	p
0	0	0	0.17
0	0	1	0.18
0	1	0	0.09
0	1	1	0.04
1	0	0	0.25
1	0	1	0.1
1	1	0	0.09
1	1	1	0.08

a) p(x)=0.08+0.10+0.04+0.18=0.40

b) p(~x|y)=(0.09+0.09)/(0.08+0.09+0.04+0.09)=0.6

c) p(~y|x,~z)=P(~y,~x,~z)/p(x,~z)=0.18/(0.04+0.18)=0.8181

d) p(x|z,y)=0.08/(0.08+0.09)~=0.47 and p(x|y)=(0.08+0.04)/(0.08+0.09+0.04+0.09)=0.4 because p(x|z,y)=p(x|y) , p(z|x,y)=p(z|y), p(x,z|y)=p(x|y)*p(z|y) so we conclude that they are not conditionally independent

p(x,z|y)=p(x|y)p(z|y)
p(x,z|y)=p(x,z,y)/p(y)=0.08/0.3=0.27
p(x|y)p(z|y)=(1-0.6)* p(z,y)/0.3=4/3(0.8+0.9)=0.23 !=0.27 → not conditionally independent

e) p(x|y,z)=0.47, p(x|z)=(0.08+0.1)/(0.08+0.09+0.1+0.25)=~0.35 so not conditionally independent
p(x,y|z)=p(x|z).p(y|z)
p(x,y|z)=0.08/0.52=0.154
p(x|z)p(y|z)=18/52 * 17/52=0.113 != 0.154 → not conditionally independent

2)

p(lightning)=p(l)
p(storm)=p(s)
p(thunder)=p(t)
p(camp fire)=p(c)
p(forest fire)=p(f)
a)P(t)=p(t=T,l=T,s=T)+p(t=T,l=T,s=F)+p(t=T,l=F,s=F)+p(t=T,l=F,s=F)=0.1316+0.015+0.0376+0.19=0.3742

b) p(t,f)=p(t|~l)p(f|~l,~c)p(~l)p(~c)+p(t|~l)p(f|~l,c)p(~l)p(c)+p(t|l)p(f|l,~c)p(l)p(~c)+ p(t|l)p(f|l,c)p(l)p(c)=0.25*0.01*0.82*0.4+0.25*0.15*0.82*0.6+0.94*0.5*0.18*0.4+0.94*0.6*0.18*0.6=~0.64

c) p(s|t)=p(s,t)/p(t)=(p(s,l,t)+p(s,~l,t))/p(t)=(p(s)p(l|s)p(t|l)+p(s)p(~l|s)p(t|~l))/p(t)
p(s,t)=sigma over l=T,F of (p(s)*p(l=l|s)*p(t|l=l)=0.2*0.7*0.94+0.2*0.3*0.25=0.1466
→ p(s|t)=0.1466/0.3742=~0.39

d)

p(c|~t)=p(c,~t)/p(~t)=p(c,~t,l,f)+p(c,~t,l,~f)+p(c,~t,~l, f)+p(c,~t,~l,~f)=p(c)/p(t) * (p(~t,l)+p(~t,~l))
=(p(c)/p(~t))* p(~t)=p(c)=0.6 → independent

e)

P(l,f)=p(l,f,c)+p(l,f,~c)=p(f|l,c)p(l,c)+(f|l,~c)p(l,~c)
p(l,c)=p(l,c,~t,~f)+p(l,c,~t,f)+p(l,c,t,~f)+p(l,c,t,f)
p(l,p)=0.6*0.18*0.6+0.5*0.18*0.4=0.1008