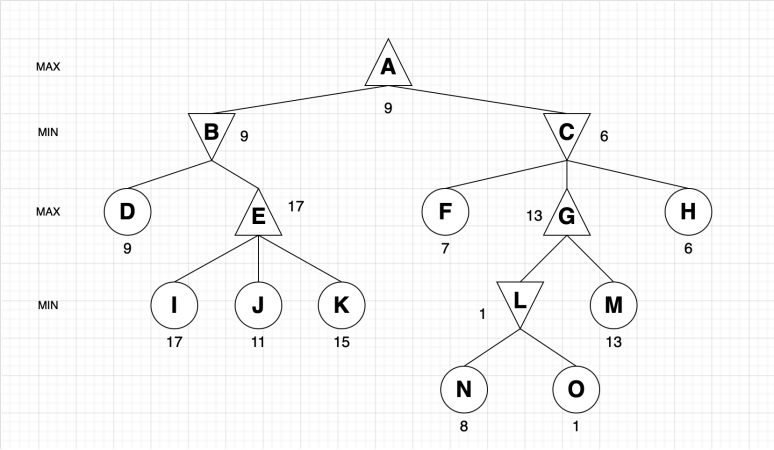
FAI Homework Assignment #2

B09902136

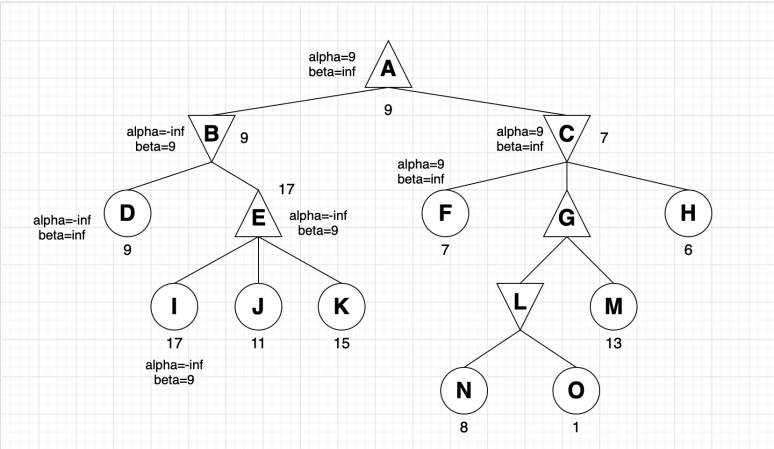
April 9, 2023

Problem 1

(a)

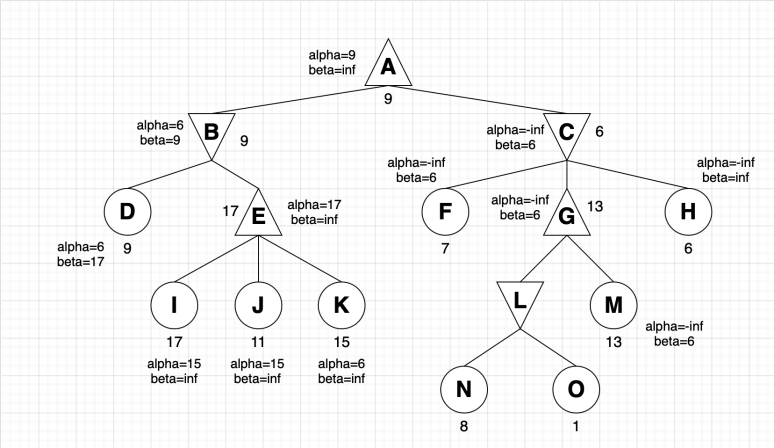


(b)



Nodes G, H, J, K, L, M, N, O are not examined due to pruning.

(c)



Nodes L, N, O are not examined due to pruning.

Problem 2

(a) 1. Let A be the given propositional formula. Below is the truth table for A.

p	q	r	A
F	F	F	F
F	F	T	T
F	T	F	F
F	T	T	T
T	F	F	F
T	F	T	T
T	T	F	F
T	T	T	T

One can see that $A \equiv r$.

2. Let A be the given proposition formula. Below is the truth table for A.

p	q	r	A
F	F	F	T
F	F	T	T
F	T	F	T
F	T	T	T
T	F	F	T
T	F	T	T
T	T	F	T
T	T	T	T

One can see that $A \equiv True$.

(b) $A \coloneqq True$.

(c) $(p \wedge q) \vee (q \wedge r) \vee (p \wedge r)$.

(d) From $(r \rightarrow A) \equiv (r \rightarrow (p \wedge q))$, we know that when r is $True$, A should evaluate to the same boolean value as $p \wedge q$. Meanwhile, from $(A \rightarrow r) \equiv (\neg(p \vee q) \rightarrow r)$, we also know that when r is $False$, A should evaluate to the same boolean value as $\neg(p \vee q)$. This gives us an answer:

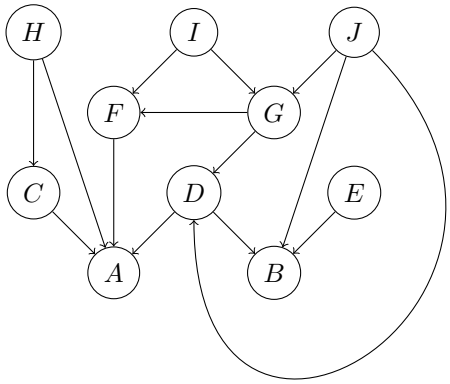
$$A \coloneqq (r \rightarrow (p \wedge q)) \wedge (\neg r \rightarrow \neg(p \vee q)) .$$

Problem 3

(a)

$$P(A|C,D,F,H,I)P(B|D,E,G,J)P(C)P(D|I)P(E|J)P(F)P(G|I)P(H|I)P(I)P(J)$$

(b)



(c)

$$P(w = t|S = t \wedge R = f)P(S = t|C = f)P(R = f|C = f)P(C = f)$$

Problem 4

(a) A, C, D, G, I, and J are d-separated from F given E.

(b) Only L is d-separated from F given E and K.