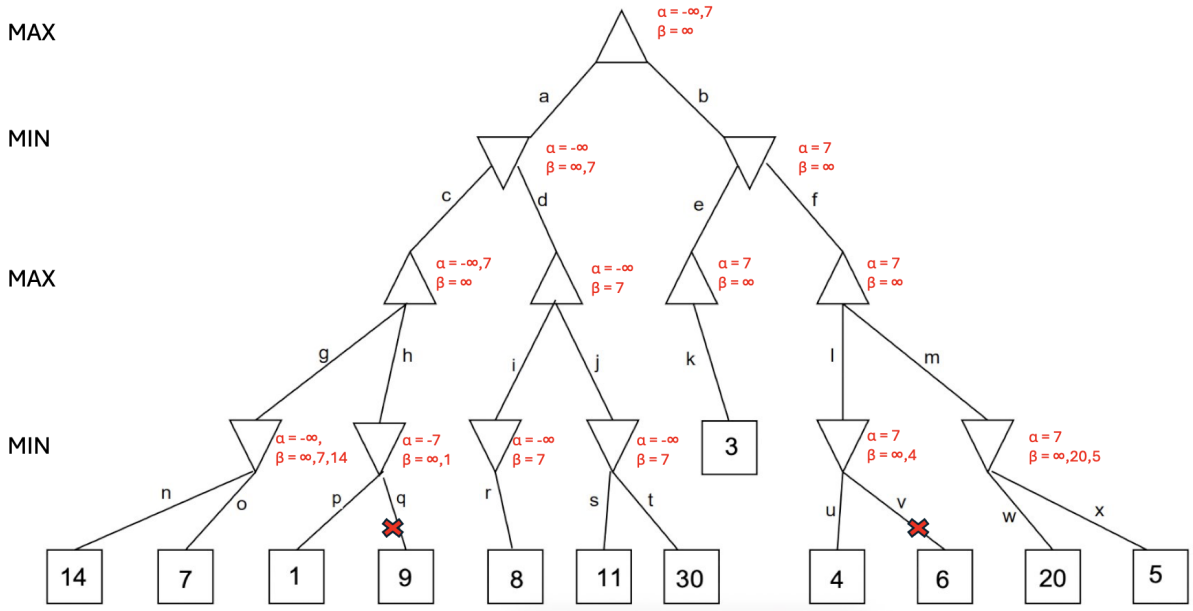
CS47100: Introduction to AI Fall 2025

Assignment 2

NAME HERE Date: October 19, 2025

Problem 1 (a)



$\alpha = 7, \beta = \infty, v = (7, 5)$

Problem 1 (b)

edges that are pruned q, v

Problem 2

(a) $X = \{S, T, M, F, K\}$

$D = \{5, 10, 20, 40\}$

$C = \{C_1, C_2, C_3, C_4, C_5\}$

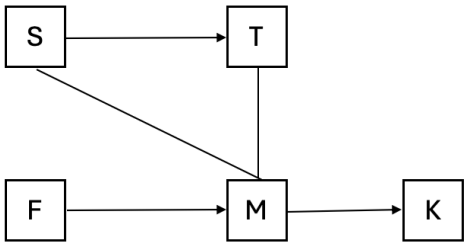
$C_1 = \{(s, t) \in D^2 : s > t\}$ on (S, T)

$C_2 = \{(m, f, k) \in D^3 : f > m > k\}$ on (M, F, K)

$C_3 = \{(m, s) \in D^2 : m \neq s\}$ on (M, S)

$C_4 = \{(m, t) \in D^2 : m \neq t\}$ on (M, T)

$C_5 = \{t \in D : t \neq 5\}$ on T



(b)

(c) $\star$ T is the arc head and S is the arc tail, update $S = \{40\}$

$\star$ S is updated, let S bet the new arc head. For each neighbor of S: (1) $T = \{20\}$ which is consisted with current S. (2) M needs to be updated with $M = \{5, 10, 20\}$

$\star$ M is updated, let M be the new arc head. For each neighbor of M: (1) $T = \{20\}$, so M must be updated with $M = \{5, 10\}$, (2) K needs to be updated with $K = \{5\}$, (3) F needs to be updated with $F = \{20, 40\}$, (4) $S = \{40\}$ is consistent.

$\star$ K is updated, let K be the new arc head. For each neighbor of K: (1) M needs to be updated with $M = \{10\}$.

$\star$ M is updated, let M be the new arc head. For each neighbor of M: (1) $T = \{20\}$, which is consistent, (2) $K = \{5\}$, which is consistent, (3) $F = \{20, 40\}$ which is consistent, (4) $S = \{40\}$, which is consistent. All edges connected to M are consistent. Propagation stops.

(d) T-shirt = \$20, Sweater = \$40, Flags = \$40, Mugs = \$10, Key-holder = \$5

Problem 3 (a) $A \wedge \neg O$

Problem 3 (b) $L \iff O$

Problem 3 (c) $O \Rightarrow L$

Problem 3 (d) $(O \wedge \neg A) \Rightarrow (L \wedge M)$

Problem 3 (e)

$L \Rightarrow (O \oplus \neg A)$

Problem 4 (a)

P	Q	$P \iff Q$	$P \oplus Q$	$(P \iff Q) \wedge (P \oplus Q)$
T	T	T	F	F
T	F	F	T	F
F	T	F	T	F
F	F	T	F	F

Unsatisfiable

Problem 4 (b)

P	Q	$P \Rightarrow Q$	$Q \Rightarrow Q$	$(P \Rightarrow Q) \vee (Q \Rightarrow P)$
T	T	T	T	T
T	F	F	T	T
F	T	T	F	T
F	F	T	T	T

Valid

Problem 4 (c)

P	Q	R	$P \oplus Q$	$(P \oplus Q) \wedge R$
T	T	T	F	F
T	F	T	T	T
F	T	T	T	T
F	F	T	F	F
T	T	F	F	F
T	F	F	T	F
F	T	F	T	F
F	F	F	F	F

Satisfiable

Problem 4 (d)

P	Q	$P \iff Q$	$\neg P$	$\neg Q$	$\neg P \iff \neg Q$	$(P \iff Q) \iff (\neg P \iff \neg Q)$
T	T	T	F	F	T	T
T	F	F	F	T	F	T
F	T	F	T	F	F	T
F	F	T	T	T	T	T

Valid

Problem 4 (e)

S	C	R	$C \Rightarrow R$	$S \wedge (C \Rightarrow R)$	$\neg S$	$\neg S \vee C$	$S \wedge R$	$(\neg S \vee C) \Rightarrow (S \wedge R)$	$(S \wedge (C \Rightarrow R)) \oplus ((\neg S \wedge R) \Rightarrow (S \wedge R))$
T	T	T	T	T	F	T	T	T	F
T	F	T	T	T	F	F	T	T	F
F	T	T	T	F	T	T	F	F	F
F	F	T	T	F	T	T	F	F	F
T	T	F	F	F	F	T	F	F	F
T	F	F	T	T	F	F	F	T	F
F	T	F	F	F	T	T	F	F	F
F	F	F	T	F	T	T	F	F	F

Unsatisfiable