1 Part 1 Theory

1.1 Task 1 Flow Networks

a) List all s-t cuts in Flow Network Alpha and their capacities.
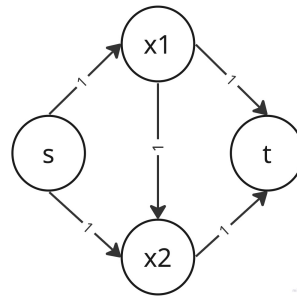
We have Flow Network Alpha in figure 1.

Figure 1: Flow Network Alpha

We find the cuts from s-t by creating cuts $(\{s\}, \{x_1, x_2, t\})$, $(\{s, x_1\}, \{x_2, t\})$, $(\{s, x_2\}, \{x_1, t\})$ and $(\{s, x_1, x_2,\}, \{t\})$.
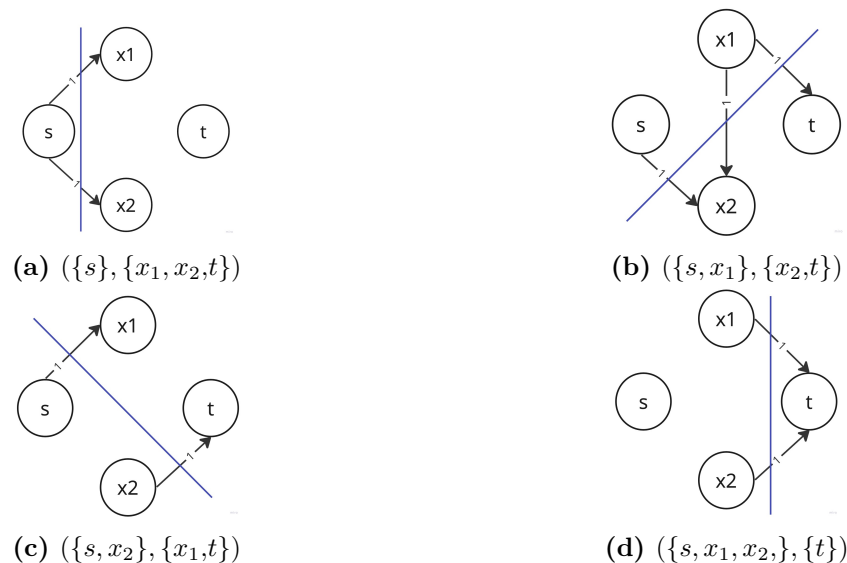

(a) $(\{s\}, \{x_1, x_2, t\})$

(b) $(\{s, x_1\}, \{x_2, t\})$

(c) $(\{s, x_2\}, \{x_1, t\})$

(d) $(\{s, x_1, x_2,\}, \{t\})$

Figure 2: Cut graphs of flow network Alpha

We analyse the cut graphs:

- From figure 2a, we see that the s-t cut $(\{s\}, \{x_1, x_2, t\})$ has capacity $c(s,t) = 2$.

- From figure 2b, we see that the s-t cut $(\{s, x_1\}, \{x_2, t\})$ has capacity $c(s,t) = 3$.

- From figure 2c, we see that the s-t cut $(\{s, x_2\}, \{x_1, t\})$ has capacity $c(s,t) = 2$.

- From figure 2d, we see that the s-t cut $(\{s, x_1, x_2,\}, \{t\})$ has capacity $c(s,t) = 2$.

b) Minimum s-t cut in Flow Network Bravo and its capacity.

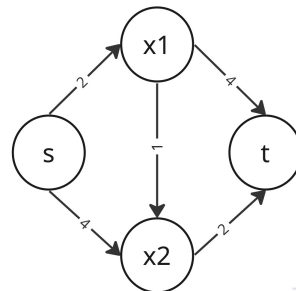We have the Flow Network graph Bravo in figure 3.

Figure 3: Flow Network Bravo

When we analyse flow network Bravo we find that the minimum s-t cut $(\{s, x_2\}, \{x_1, t\})$, which has a capacity $c(s,t) = 5$.
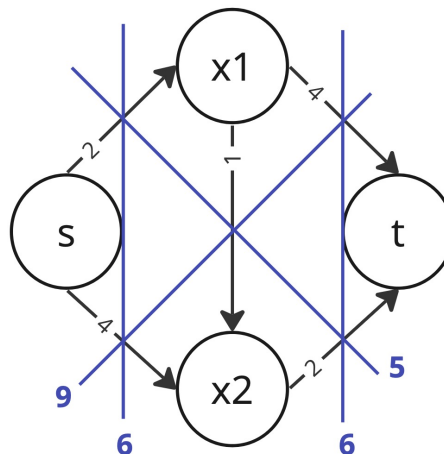

Figure 4: Minimum s-t cut in flow network Bravo

c) value of computed flow in Flow Network Charlie.

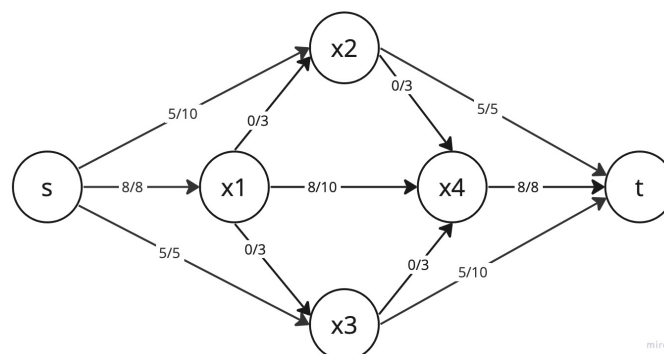We have the Flow Network graph Charlie in figure 5.

Figure 5: Flow Network Charlie

The computed flow is computed by looking at the flow going into the sink t. For Flow Network Charlie, the computed flow is 18.
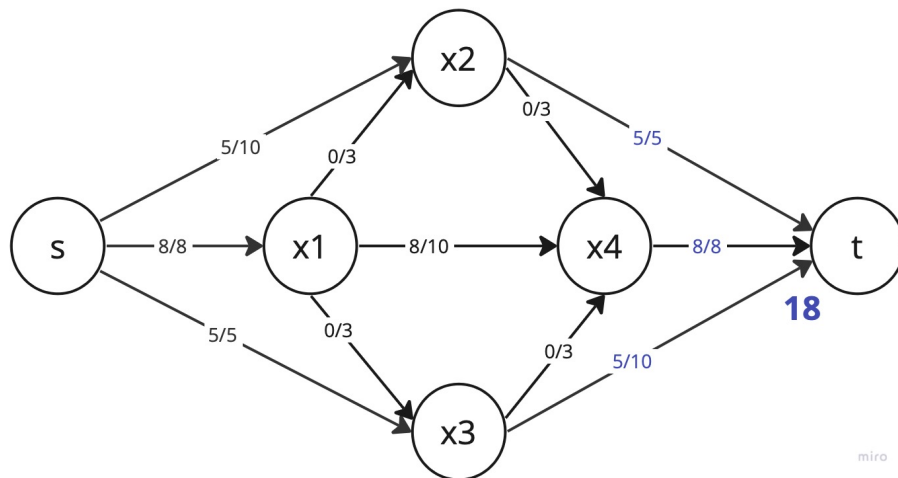
Figure 6: Computed flow in Flow Network Charlie

Something about how this is not the maximum flow

d) Minimum s-t cut in Flow Network Delta and its capacity.
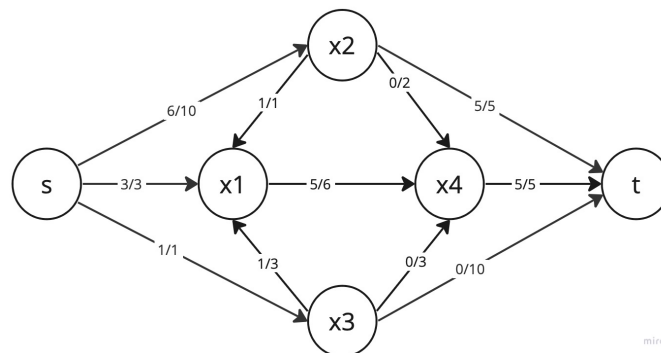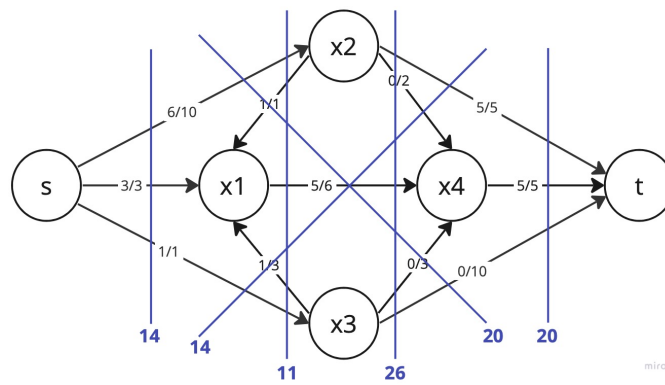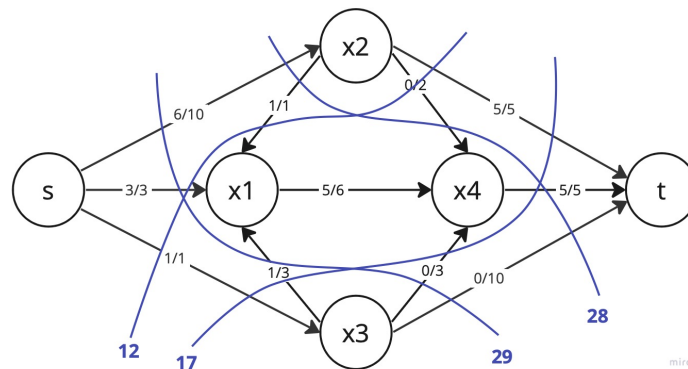
We have the Flow Network graph Delta in figure 7.

Figure 7: Flow Network Delta

(a) $(\{s\}, \{x_1, x_2, t\})$

(b) $(\{s, x_1\}, \{x_2, t\})$

Figure 8: Cut graphs of flow network Alpha