Assignment 7

HANDIN:

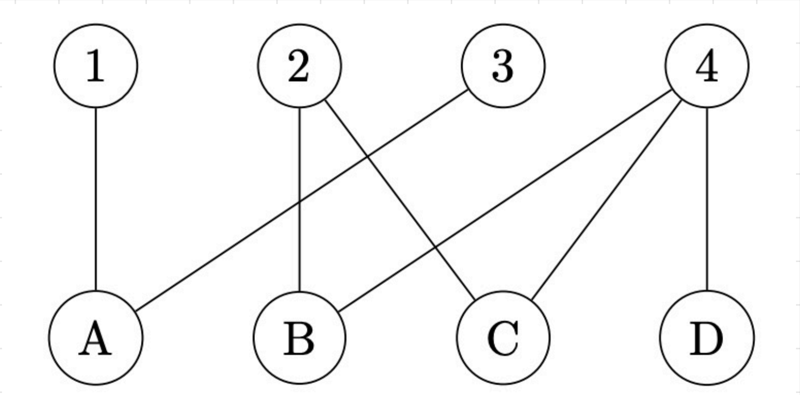
25.10.24

problem 1

Statement 1:
Disproven -> A maximum flow dose not define a unikumet minimum capacity cut because multiple cuts with the same capacity may exist.

Statement 2:
Prøven -> A minimum capacity cut uniquely defines the maximum flow value, as the total flow vannet exceed the cuts capacity.

problem 2



TOP set X: $\{1, 2, 3, 4\}$
bottom set Y: $\{A, B, C, D\}$ => Hall condition $|N(S)| \geq |S|$ for all $S \subseteq X$

$S = \{1\}$, $N(S) = \{A\}$ => $|N(S)| = 1 \geq |S| = 1$

$S = \{2\}$, $N(S) = \{B, C$ => $|N(S)| = 2 \geq |S| = 1$

$S = \{3\}$, $N(S) = \{A\}$ => $|N(S)| = 1 \geq |S| = 1$

$S = \{4\}$, $N(S) = \{C, D, B\}$ $|N(S)| = 3 \geq |S| = 1$

largr subsets:

$S = \{1, 2\}$, $N(S) = \{A, B, C\}$, $|N(S)| = 3 \geq |S| = 2$

$S = \{3, 4\}$, $N(S) = \{A, B, C, D\}$, $|N(S)| = 4 \geq |S| = 2$

$S = \{1, 2, 3\}$, $N(S) = \{A, B, C\}$, $|N(S)| = 3 \geq |S| = 3$

$S = \{1,2,3,4\}, N(S) = \{A, B, C, D\}, |N(S)| = 4 \geq |S| = 4$

Hall condition holds for all subsets

$\Rightarrow$ a perfect matching exists $\square$

problem 3

* create a source(V) and sink (V) add vertices for each device $d_1, d_2, \ldots$ and each cell tower $c_1, c_2, \ldots$

* From source to each device, capacity is 1.

  From each device d, to nearby tower c capacity is 1

  From each tower c to sink t capacity is N (tower limit)

$\rightarrow$ Algorithm (Ford-Fulkerson or Edmonds-Karp)

approach cheks if every device can connect with the given constraints.