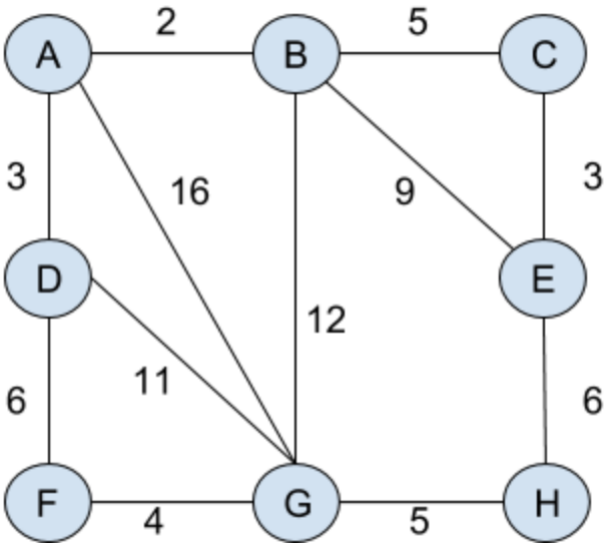
SFWR ENG 3O03 / COMP SCI 4O03 (6O03)
Linear Optimization

Problem Set 3 – 15 points

Handed out: November 6, 2018
Due date: November 29, 2018

** JUSTIFY YOUR ANSWERS **

1. Find the shortest path from vertex A to vertex H in the following graph using Dijkstra's algorithm. *Show each step of the algorithm.* **3p**



2. Consider the following system of difference constraints.

$$
\begin{aligned}
x_2 - x_1 &\leq 8 \\
x_3 - x_1 &\leq 4 \\
x_3 - x_2 &\leq -3 \\
x_4 - x_3 &\leq 10 \\
x_2 - x_4 &\leq -2 \\
x_5 - x_2 &\leq -4 \\
x_5 - x_3 &\leq -1 \\
x_4 - x_5 &\leq 12 \\
x_4 - x_6 &\leq 3 \\
x_6 - x_5 &\leq 4 \\
x_6 - x_7 &\leq 1 \\
x_7 - x_5 &\leq 2
\end{aligned}
$$

2.1. Model it as a constraint graph. **2p**

2.2. Use Bellman-Ford algorithm to find a feasible solution or to determine that no feasible solution exists. **4p**

3. A major city contains a network of roads to allow travellers to go from the one side to the other. The local traffic network is shown below:

From	To	Capacity (Thousands)
A	C	6
A	D	5
B	C	4
B	E	2
B	D	3
C	F	5
D	G	4
C	E	1
E	F	4
E	G	6

While A and B correspond to the two entry points to the city, F and G correspond to the two exit points of the city. C and D are toll booths and can only only service a maximum of 7 thousand vehicles for C, and 4 thousand vehicles for D.

3.1. Model it as a max flow problem. **2p**

3.2. Solve the maximum flow problem using Ford-Fulkerson algorithm. *Show each step of the algorithm and specify the augmenting path for each iteration.* **4p**

- Your solution must reach your instructor or the TA by or before the due date.
- You, or your reliable friend must give your work to the TA hand-to-hand or deliver at class to your instructor.
- You have to sign your assignment; your signature certifies that the assignment is **your** work.
- If you use some software to reach a solution, explain how.