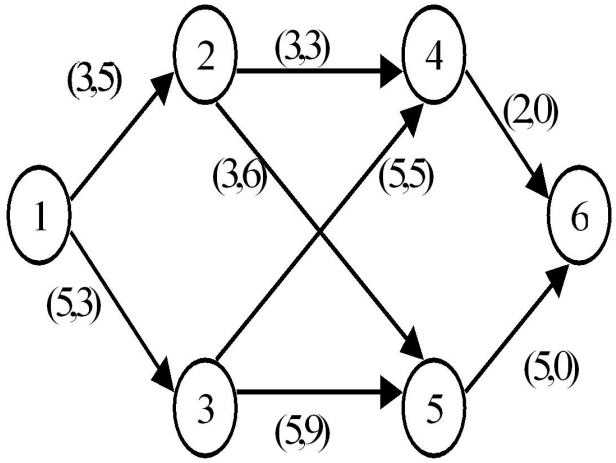
MP305 Practical 2020/2021 - Network Flows II

Solutions to **all** questions with **(*)** have to be shown (and explained) to the instructor at the practicals in order to get 5% that count towards the overall mark.

- The `Python` notebook `Network_Flows_II` that contains the maximal network flow algorithm can be accessed via any web browser. See the **MP305 Blackboard** web page for details and instructions.
- Solutions to **all** questions with **(*)** have to be submitted as a pdf document through Blackboard. You must include some text commentary (in Python notebook Markdown cells) to explain your answers to the questions asked.
- This practical is worth 5% of your final grade.

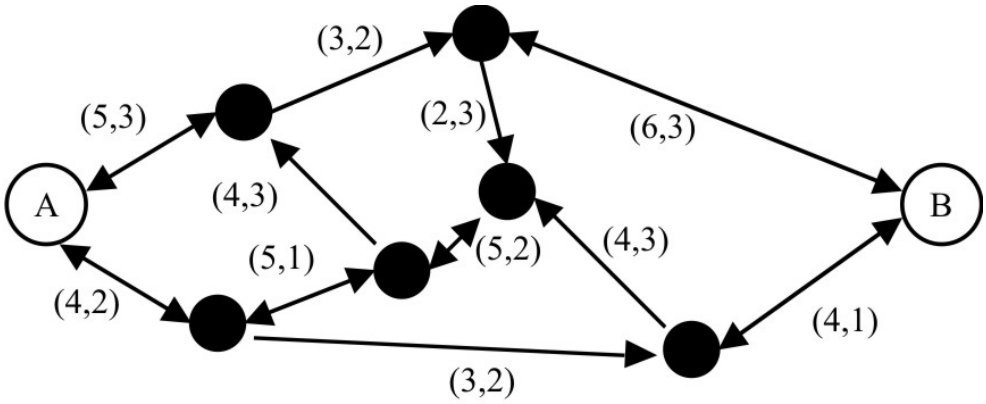
1. Find the maximal flow for minimal cost for the network below where (capacity,cost) is shown:



This is the example discussed in class. You may read in the data for the example from the Python workbook `Network_Flows_II`

Find the incremental network, its capacities and costs at each iteration.

2. (*) A road network is shown below with the capacity and time taken per car on each road indicated. Find the maximal flow through the network for minimal total travel time for all care from A to B. Compare this to flow from B to A.



Note: You can use the network you created in lab Network Flows I, Question 3.

3. (*) A soft drinks firm buys fruit at the beginning of each month i at a cost per 100kg of p_i in units of €1000. The firm can store up 2000kg of fruit at any given time but the cost in units €1000 of refrigeration per month per 100kg is r_i. The consumption requirements are c_i per month in 100kg units. Based on last year's figures the following estimates have been made:

i	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
p_i	18	17	17	15	12	8	7	6	9	12	14	17
r_i	1	1	2	2	3	5	6	6	5	3	2	1
c_i	9	6	6	7	11	14	16	18	15	10	7	6

(a) Find the best purchasing schedule starting from January based on these estimates assuming that the firm has no fruit in storage on Jan 1st. How much will fruit cost for the year and how much will be spent on refrigeration?

(b) Suppose that the firm has 500kg of fruit in storage at the beginning of the year. What is the best purchasing schedule that ensures that 500kg are again in storage at the very end of the year?