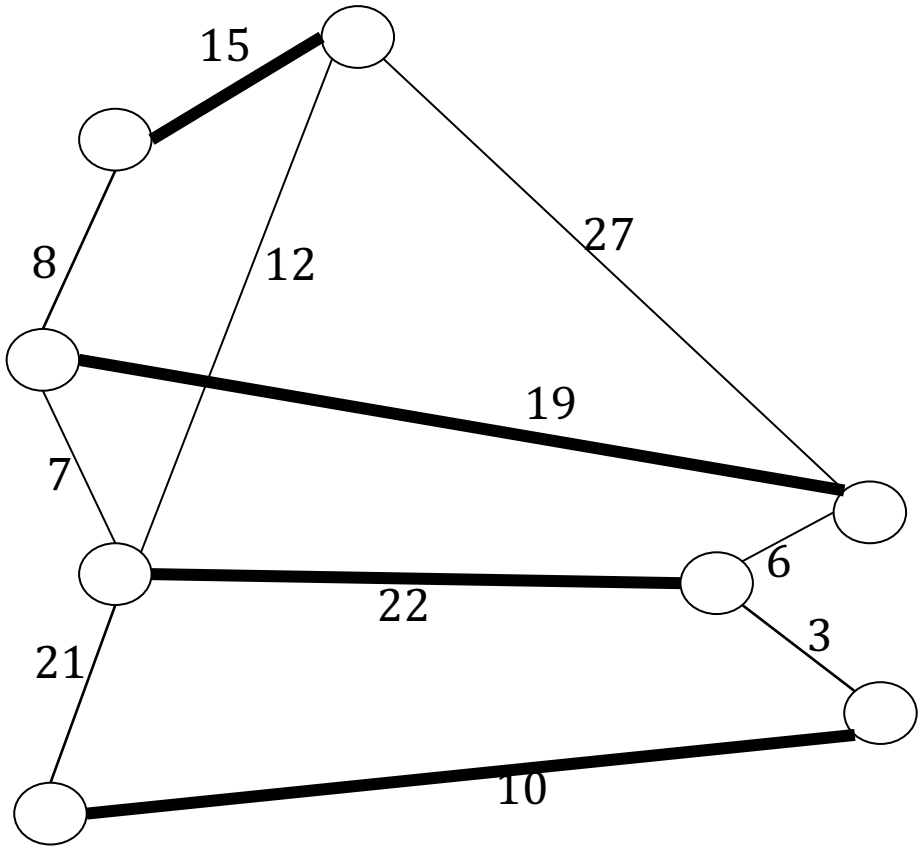
Network Design [Network Flows]
June, 6th 2017

Surname _____
Name _____
Matricola ID _____

Exercise 1
Find the minimum weight perfect matching on the following graph starting from the perfect matching represented by thick arcs.



Exercise 2

Evaluate the optimal solution to the following linear program

$$\min 21\,x_1 + 24\,x_2 + 41\,x_3 + 36\,x_4 + 15\,x_5 + 13\,x_6$$
s.t.
$$x_1 + x_2 \geq 20$$
$$x_1 + x_2 + x_3 \geq 22$$
$$x_2 + x_3 + x_4 + x_5 \geq 51$$
$$x_4 + x_5 \geq 33$$
$$x_1 + x_2 + x_3 + x_4 \geq 21$$
$$x \geq 0$$

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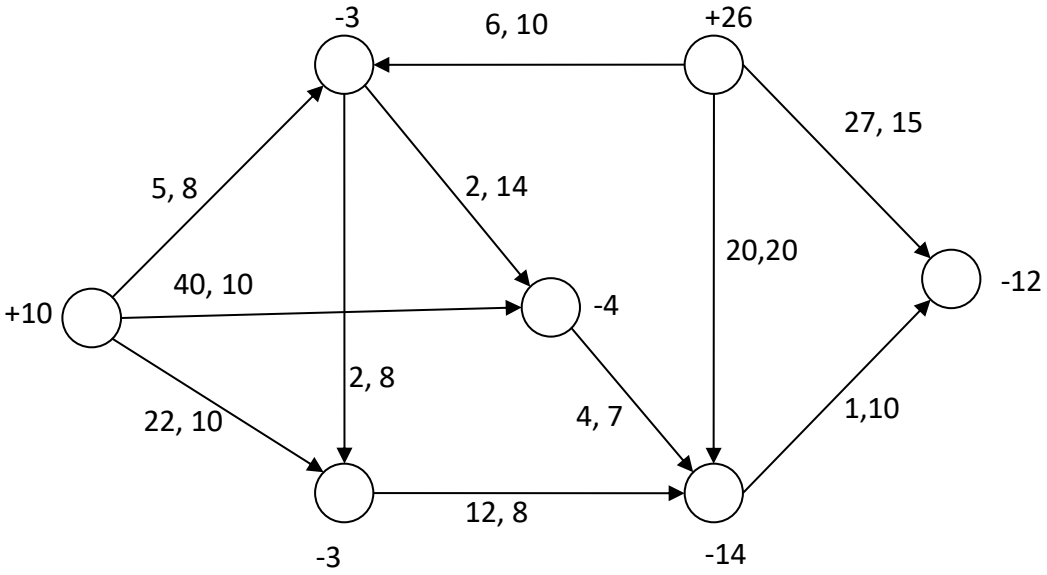
Exercise 3
Evaluate the min cost flow on the following graph.
[(c_{ij}.u_{ij}) are the figures represented on the arcs]



Network Design [Network Flows]
June, 6th 2017

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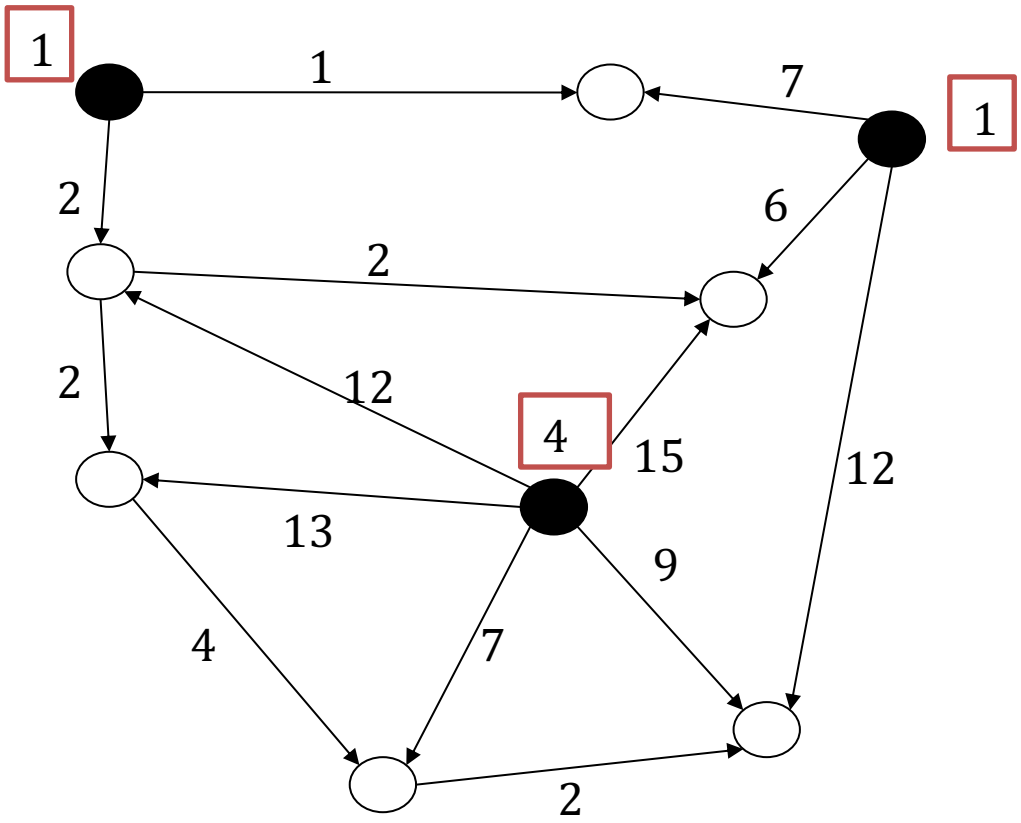
Bonus question

The following graph represents a distribution network in which black nodes are warehouses and white nodes customers. Each customer requires one unit of a good that can be supplied from any warehouse. Figures on the arcs represent the cost of shipping the good on that arc (arcs are uncapacitated), while numbers in the box represent the availability of the good in each warehouse.

1. Find the minimum cost shipping solution.
2. Suppose to have the possibility of moving all goods from the central warehouse to the warehouse on the top left corner. How much would you be willing to pay for this?



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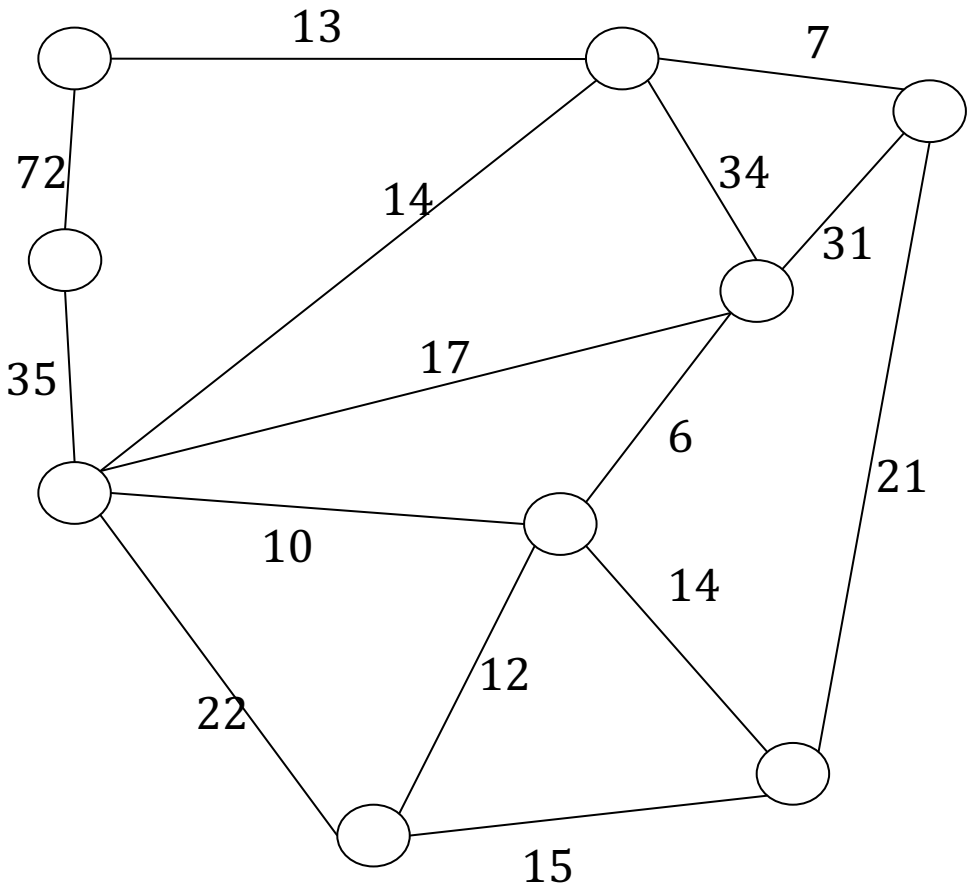
June, 6th 2017

Exercise 4

Find the minimum cut on the following graph:

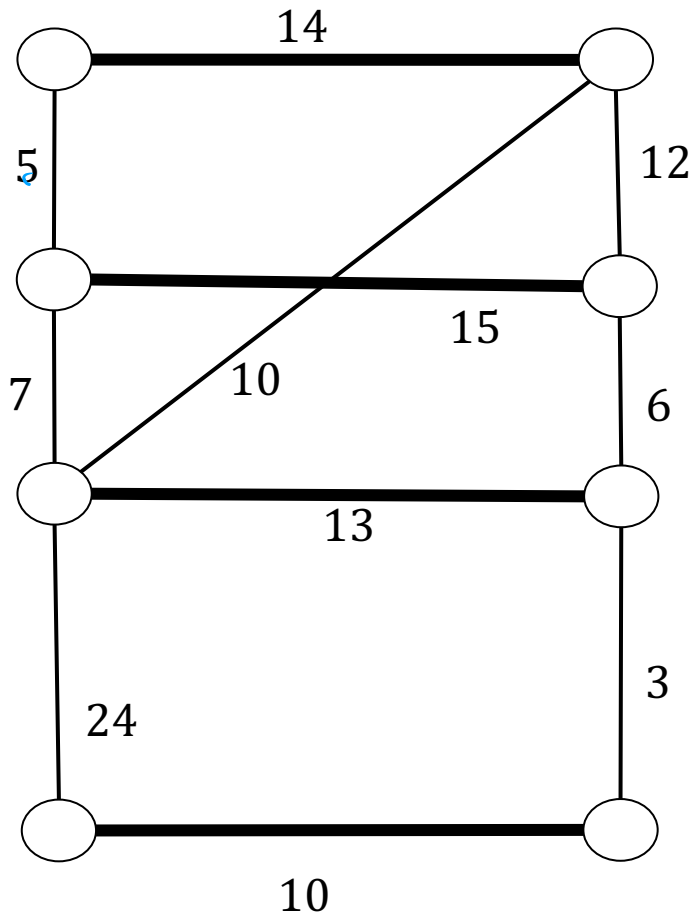


Network Design [Network Flows]
May, 24th 2018

Surname _____
Name _____
Matricola ID _____

Exercise 1

Find the minimum weight perfect matching on the following graph starting from the perfect matching represented by thick arcs.



Exercise 2

Evaluate the optimal solution to the following linear program

$$\min 51\,x_1 + 34\,x_2 + 27\,x_3 + 16\,x_4 + 25\,x_5 + 19\,x_6$$

s.t.

$$x_1 + x_4 \geq 25$$
$$x_2 + x_3 + x_5 \geq 23$$
$$x_1 + x_2 + x_3 + x_5 \geq 21$$
$$x_2 + x_5 \geq 14$$
$$x_1 + x_2 + x_4 + x_5 \geq 39$$
$$x \geq 0$$

Network Design [Network Flows]
May, 24th 2018

Surname _____
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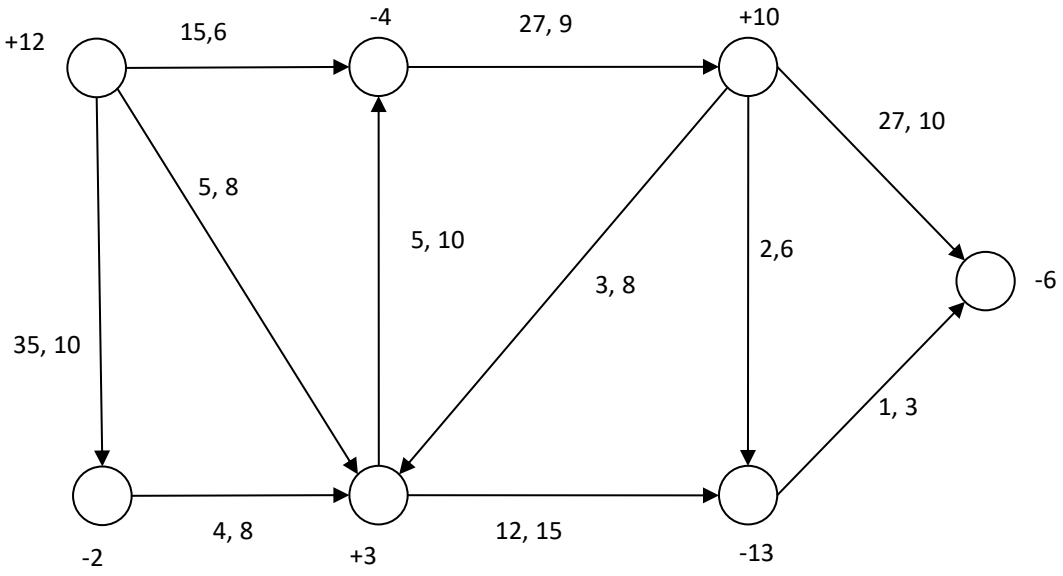
Matricola ID _____

Exercise 3
Evaluate the min cost flow on the following graph.
[(c_{ij}.u_{ij}) are the figures represented on the arcs]



Network Design [Network Flows]
May, 24th 2018

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Bonus question

A company has 2 types of employees: part-time (5 hour workshift) and full-time (7 hour workshift). An employee can start working at {8:00, 9:00, 12:00, 13:00}. For each hourly slot the request of personnel is the following:

8:00 9:00	9:00 10:00	10:00 11:00	11:00 12:00	12:00 13:00	13:00 14:00	14:00 15:00	15:00 16:00	16:00 17:00	17:00 18:00	19:00 20:00
12	15	17	16	12	13	7	6	5	5	2

Given a cost of 250 Euro/day for part time employees and 370 Euro/day for full time employees, find the mix of employees that fulfills the request minimizing the total cost.

Is it useful to allow full time employees start working at 11:00?

Network Design [Network Flows]
May, 27th 2019

Surname _____
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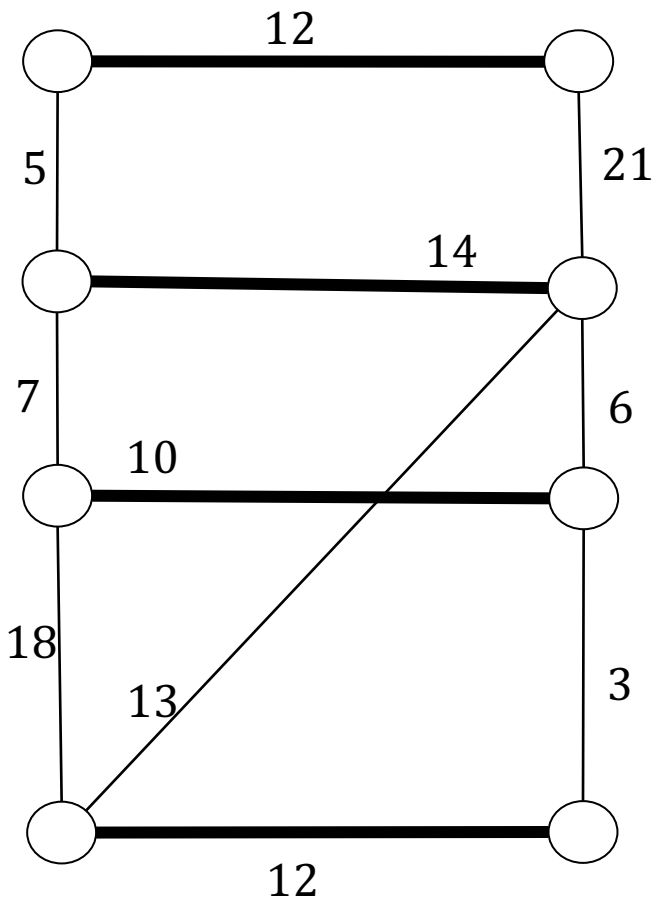
Matricola ID _____

Exercise 1
Find the minimum weight perfect matching on the following graph starting from the perfect matching represented by thick arcs.



Network Design [Network Flows]
May, 27th 2019

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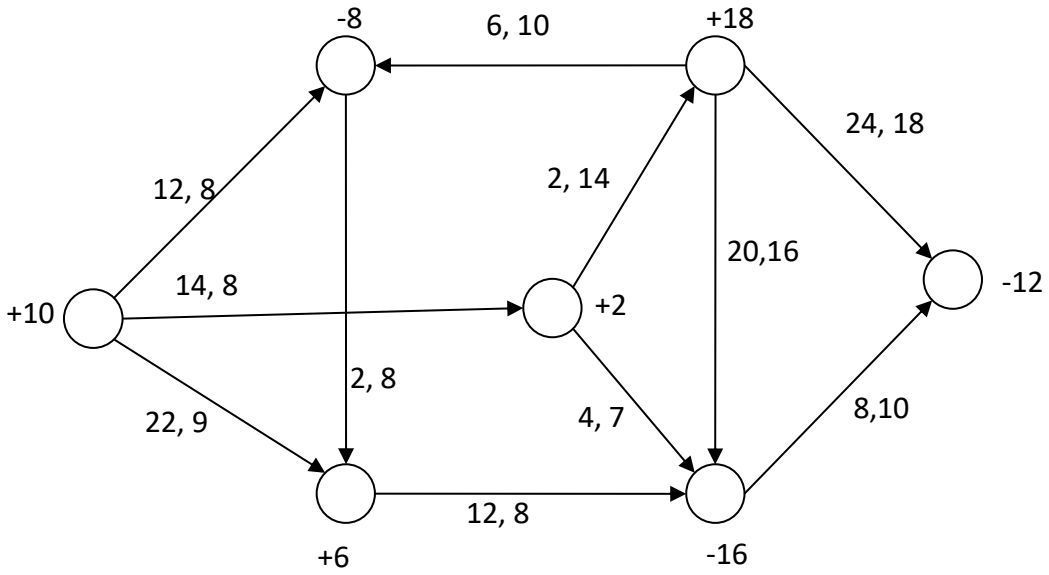
Exercise 2
Evaluate the min cost flow on the following graph.
[(c_{ij}.u_{ij}) are the figures represented on the arcs]



Exercise 3
The following graph represents a distribution network in which black nodes are warehouses and white nodes customers. Each customer requires one unit of a good that can be supplied from any warehouse. Figures on the arcs represent the cost of shipping the good on that arc (arcs are uncapacitated), while numbers in the box represent the availability of the good in each warehouse.

1. Find the minimum cost shipping solution.

[Bonus] 2. Suppose to have the possibility of moving all goods from the central warehouse to the warehouse on the top right corner. How much would you be willing to pay for this?

Network Design [Network Flows]
May, 27th 2019

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