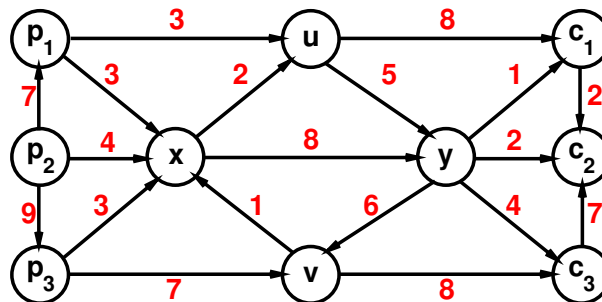


Home work for  
**Fundamental Algorithms**  
 SS 2007  
 Sheet 5

**Exercise 13:**

- a) Let  $(G, s, t, c)$  be a flow network with additional node capacities given by  $\gamma : V \rightarrow \mathbb{R}_{\geq 0}$ , i.e. the total flow through a node  $v \in V$  must not exceed  $\gamma(v)$  for all  $v \in V$ . Prove that  $(G, s, t, c, \gamma)$  can be transformed into a flow network  $(G', s', t', c')$  such that the size of the maximum flow in  $(G, s, t, c, \gamma)$  equals the size of the maximum flow in  $(G', s', t', c')$ .
- b) Let  $(G, s, t, c)$  be a flow network with  $G$  being an undirected graph. Flows in  $G$  may traverse an edge  $e \in E$  in any direction. Prove that  $(G, s, t, c)$  can be transformed into a flow network  $(G', s', t', c')$  such that the size of the maximum flow in  $(G, s, t, c)$  equals the size of the maximum flow in  $(G', s', t', c')$ .

**Exercise 14:** Consider the following transportation network:



The three power supply units  $p_1, p_2, p_3$  produce 5, 10, 5 megawatts of power, respectively. The three consumers  $c_1, c_2, c_3$  would like to consume 5, 10, 5 megawatts, respectively. The goods have to be transported across the transportation network shown above. Is this possible ?