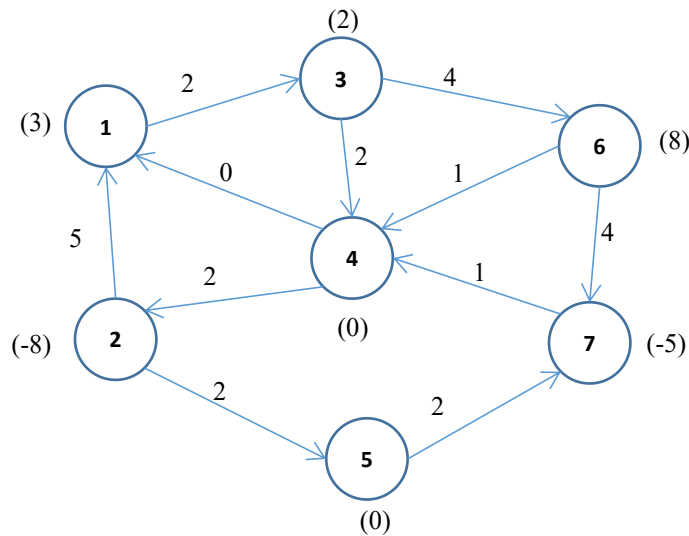


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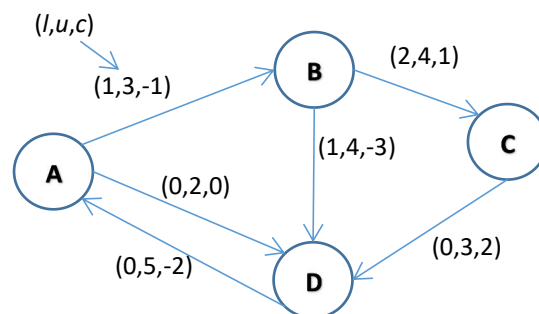
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1. Consider the following minimum cost flow problem where the number on each arc indicates its cost, and node supplies are indicated in the brackets.



Solve the problem using the Network Simplex. Start the tree solution by arcs $S = \{(1,3), (3,6), (6,7), (7,4), (4,2), (2,5)\}$. Explain all the steps. At each iteration, draw the graph with the updated flows, indicate the set T, and report the dual variables. (20 marks)

2. Consider the following network:



Solve the minimum cost problem by using out-of-kilter method. Explain all the steps. At each iteration, draw the graphs (G and G') with updated flows. (20 marks)