

## STUDY SET #2

**Question 1:** A company produces a single type of product at a plant P. The company is planning for the next two periods. Unit production cost is \$25/unit at period 1 and \$24/unit at period 2. The production capacity is 8 units per period. The company has two main retailers; retailer A and retailer B. The demand of each retailer for the next two periods is:

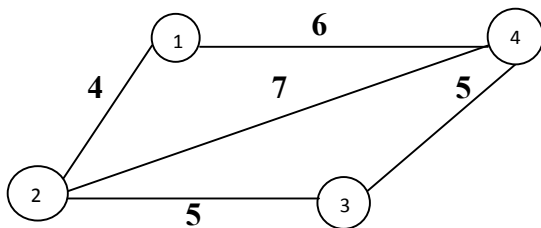
|                        | Period 1 | Period 2 |
|------------------------|----------|----------|
| <b>Retailer A (RA)</b> | 4        | 4        |
| <b>Retailer B (RB)</b> | 3        | 2        |

Assume that shipment is instantaneous. Unit shipping cost from plant P is 50 \$/unit to RA and 40 \$/unit to RB. The product may be held in inventory at P or at the retailers. Inventory holding cost per period at P is 1 \$/unit, 2 \$/unit at each of the retailers. Is the flow given below flow? Why or why not? If not, find a better solution using **network simplex** algorithm. Also provide the cost reduction.

Produce 8 units at period 1. Send 4 units to RA, 3 units to RB, and keep 1 unit in inventory at RB

Produce 5 units at period 2. Send 4 units to RA and 2 units to RB

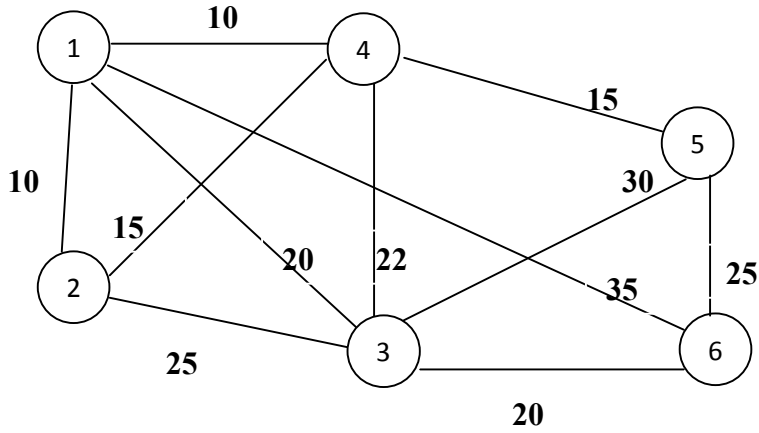
**Question 2:** Consider the following network. Suppose all 4 nodes are customers.



We want to open a DC so as to minimize the longest distance to any customer. Suppose the DC should be located along the edges (2,4), (1,4), or (2,3). Find the best location. Show all your work for full credit.

**Question 3:** Solve the TSP in the following network using Christofides algorithm. Show all your work.

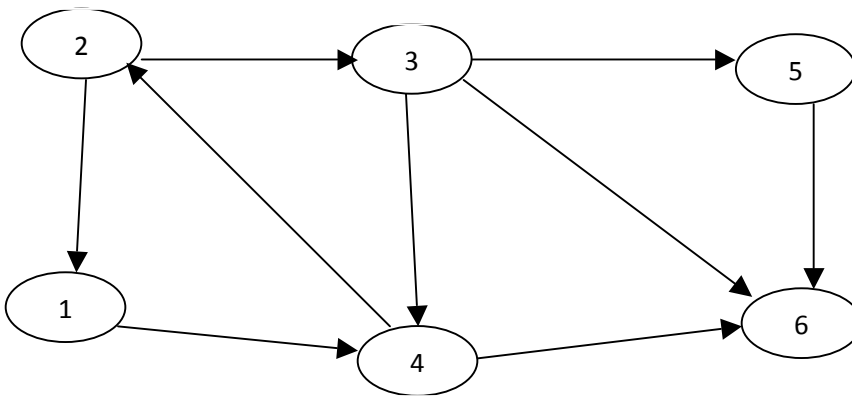
a)



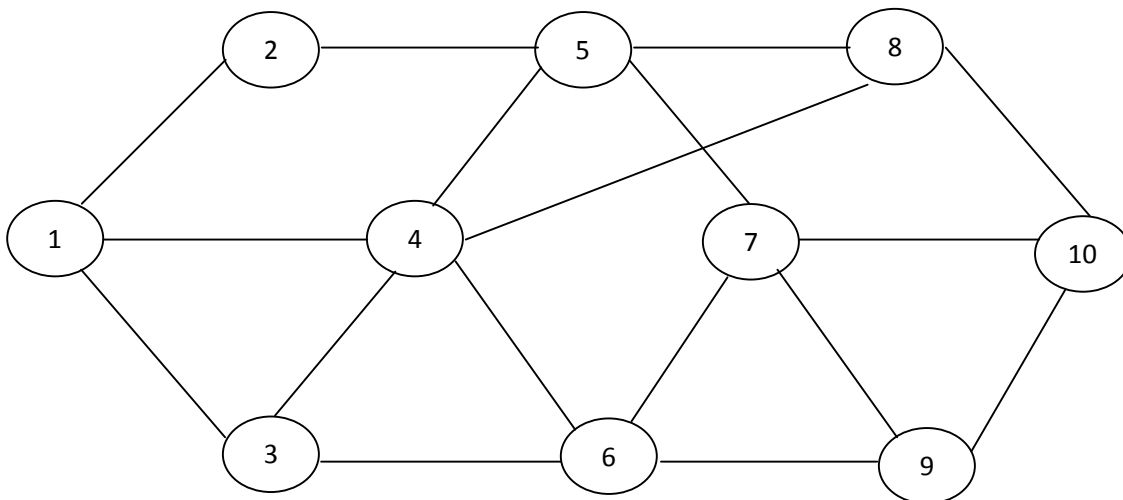
b) Solve the same TSP with patching.

**Question 4:** Solve the Chinese Postman problem (arc routing problem) on the following networks. Assume all arc costs are 1. Provide the routing structure clearly. Explain your reasoning.

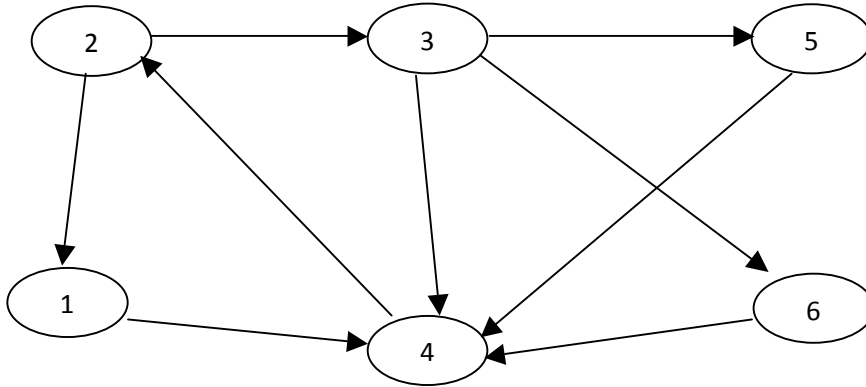
a)



b)



c)



**Question 5:** Construct a transportation network of 15 nodes. Let  $Q=20$ ,  $q_i=5$  and  $m=4$ . Assume all arc costs are 1. Let  $T=5$ . Solve the distance constrained CVRP with

- a) Savings
- b) Sweep
- c) Cluster first

Which one gives the best answer?

- d) Try to improve your solution by inter route and intra route moves

**Question 6:** Solve the following assignment problem with the following disutility matrix.

|   |   |   |   |   |
|---|---|---|---|---|
| 8 | 3 | 5 | 2 | 4 |
| 4 | 5 | 3 | 6 | 7 |
| 6 | 2 | 1 | 3 | 5 |
| 3 | 7 | 2 | 4 | 3 |
| 5 | 2 | 6 | 3 | 4 |