FIT3158 Business Decision Modelling

Tutorial 6

Network Modelling II

Topics covered:

- **Transportation Problem**
- **Assignment Problem**
- **Transhipment Problem**

Various techniques will be explored:

- North-west Corner Method;
- Vogel's Approximation Method (VAM)
- MODI or the Closed-Loop Path

Exercise 1: Transportation Problem (Supply = Demand)

An oil supply company has four depots in Victoria each with different supply capabilities. The four depots are required to service the needs of four outlets that have different demands. The available supplies at the depots, the demands of the outlets and the cost of delivery are given in the following table:

	Outlet				Supply
Depot	X1	X2	X3	X4	
D1	13	8	6	9	160
D2	9	10	12	17	100
D3	15	11	7	8	240
Demand	180	140	80	100	500

a) Solve the problem of supplying the outlets from the depots using ***Vogel's Approximation Method*** (VAM).

b) Using the allocation solution generated in (a) apply the ***MODI method (closed-loop path***) to determine the optimal allocation.

c) Draw a network model to depict this problem.

d) Formulate this transportation problem as a linear program.

e) Model this problem in a spreadsheet and determine the shipment schedule that minimises total transportation cost. Compare your results with (a) and (b).

Exercise 2: Transportation Problem (Supply ≠ Demand)
(*Adapted from: Lapin & Whisler, Chapter 12, Question 12-8*)

Consider the following distribution problem for the BugOff Chemicals plants and warehouses:

	Shipping Costs to Warehouses				Capacity
Plants	C1	C2	C3	C4	
P1	2	6	9	4	200
P2	7	1	10	12	300
P3	5	11	3	8	400
Demand	100	200	300	400	DD > SS

a) Compute total demand and total capacity. In applying the transportation method, is a dummy source or a dummy destination required? If so, incorporate the new row or column into the problem.

b) Set up a blank shipping schedule and apply ***Northwest Corner Method*** to determine a starting solution.

c) Using the allocation solution generated in (b), apply the ***MODI method*** (closed-loop path) to determine the optimal allocation.

d) Model this problem in a spreadsheet and compare the results.

Exercise 3: Assignment Problem

Doctors are being rostered for shifts according to their preferences listed below:

Doctor	1ST CHOICE	2ND CHOICE	3RD CHOICE
A	Shift 8	3	4
B	6	1	5
C	4	3	2
D	1	5	3
E	3	7	2
F	8	3	2
G	6	8	1
H	4	2	7

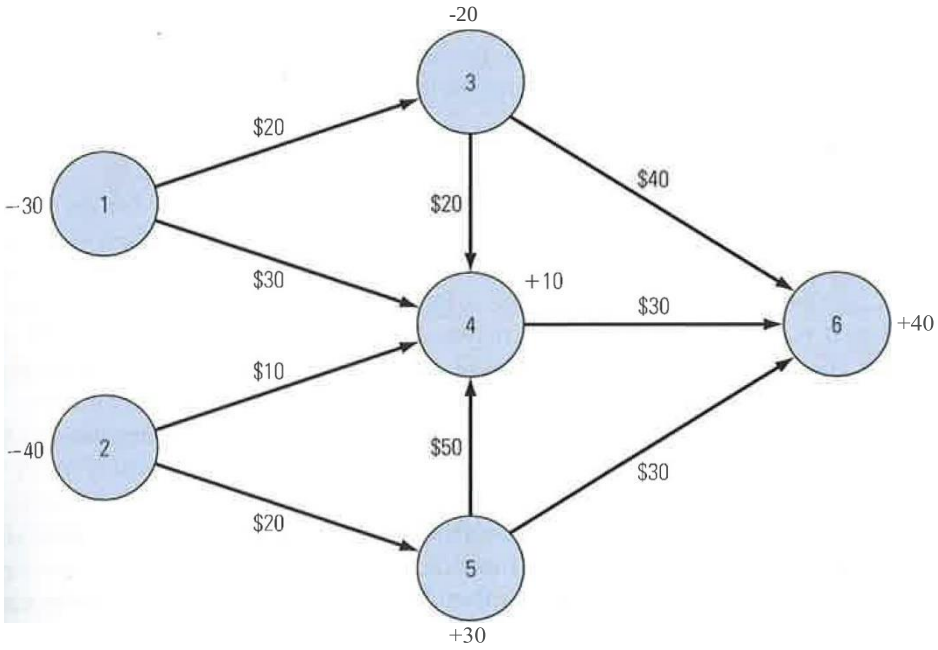
Set up this problem for solution using the Excel Solver.

Choose a suitable weighting for preferences and then vary the weights. Comment on the sensitivity of the solution to the value of the weights used. [Try weights like: (first, second, third), (10,5,1), (5,2,1), (2,1,1), (1,1,1)]

***Extra Exercise*:**

Transhipment Problem (Ragsdale 8E Q5.17/Ragsdale 9E Q5.17)

A furniture manufacturer has warehouses in cities represented by nodes 1, 2, and 3 in the following figure. The values on the arc indicate the per unit shipping costs required to transport living room suites between the various cities. The supply of living room suites at each warehouse is indicated by the negative number next to nodes 1, 2 and 3. The demand for living room suites is indicated by the positive number next to the remaining nodes.



a. Identify the supply, demand and transhipment nodes in this problem.
b. Use Solver to determine the least costly shipping plan for this problem.