Assignment – Module 3

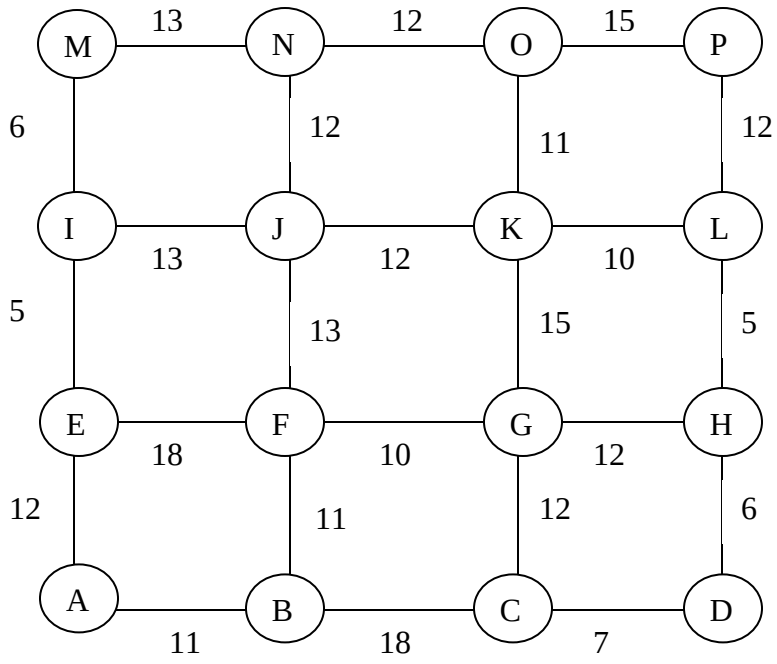
1. Inflows to a reservoir with storage capacity of 7 units during four seasons are 3, 2, 5 and 4 units respectively. Release from the reservoir during a season results in the following benefits (consider same benefits for all the four seasons)

Release	Benefits
0	-100
1	-175
2	430
3	430
4	560
5	840
6	910
7	910
8	810
9	840
10	700
11	600
12	400

   Consider reservoir storage at the beginning of the year is 0 units; obtain the release policy for the reservoir.

2. Solve the reservoir operation problem in problem no. 1 with the initial storage equal to the reservoir capacity of 7 units. Compare the release policy with that obtained in the problem no. 1.
3. Solve the same reservoir operation problem with the storage at the end of the year (that is, at the end of the last season, t=4) specified as 0 units, and with no constraint on the initial storage.
4. Solve the reservoir operation problem by combining the constraints in problems 2 and 3 (i.e., with the initial storage of 7 units and the end of year storage of 0 units). Compare the net benefits resulting from the three solutions with that of the problem no. 1.

5. A town decides to expand its water supply system with an existing capacity of 10 units to the ultimate requirement of 40 units by the end of 15 years from now, in stages of 5 years each. The present worth of cost of capacity expansion at any stage is estimated to be equal to the square of the number of units added at that stage. The capacity requirement is estimated to be 15, 25 and 40 units by the end of 5, 10 and 15 years from now. Determine how many units should be added at each stage for minimum total cost of capacity expansion over a 15 year planning horizon. Capacity can be added only in 5 unit increments.
6. A pipeline is proposed between the node A and the node P shown in the figure below.



The pipeline is allowed to pass only along the routes shown by solid lines between intermediate nodes in the figure. Distance between two nodes is shown on the line joining the two nodes. Obtain the shortest distance for the pipeline using dynamic programming

7. Water is to be allocated in discrete units of 0, 10, 20, 30, 40 and 50 among four users. The total water available for allocation is 50 units. Solve the problem using dynamic programming and obtain the maximum returns. Returns from the four users for a given allocation, are given in the table below

Allocation	Returns from			
	User 1	User 2	User 3	User 4
0	0	0	-2	0
10	3	2	3	2
20	6	2	2	1
30	6	3	5	3
40	3	6	6	10
50	1	3	1	10