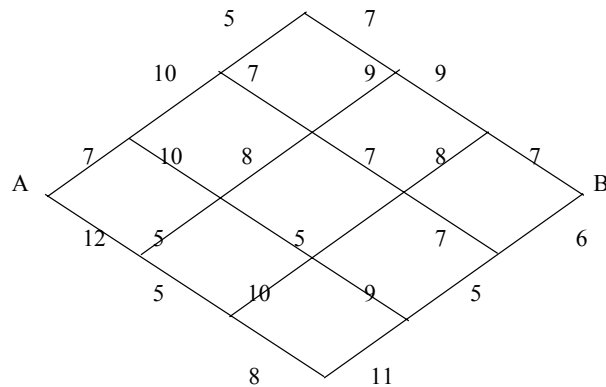


1. Consider the routing problem given below:



Assume the control values are +1 for up and -1 for down and then use dynamic programming principles to find the optimal routing path from A to B.

2. Consider the scalar *bilinear* system given by $x_{k+1} = x_k u_k + u_k^2$ with cost index, $J_0 = x_N^2 + \sum_{k=0}^{N-1} x_k u_k$. Let $N=2$ and constrain the control to take on values of -1 or +1.

Also, let us assume that the permissible states are -1,0,1,2.

- i) Use dynamic programming to find an optimal control for every conceivable x_0 .
- ii) Let $x_0=2$ and find the optimal control, trajectory, and optimal cost.