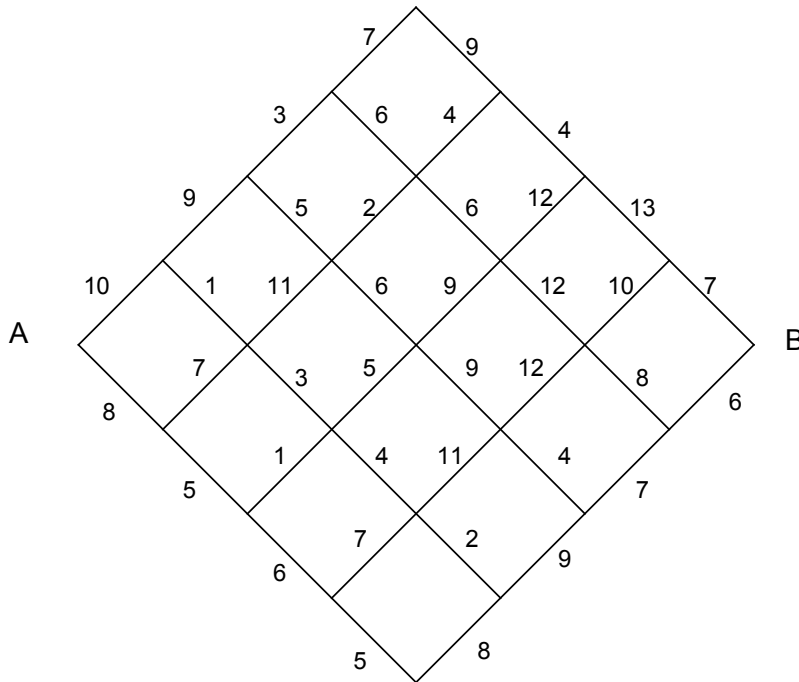


ELEC-E8101 Digital and Optimal Control
Exercise 10

1. In the diagram below, the costs for moving from one state to the other have been marked. Time flows from left to right, and the controls have been restricted to two alternatives: “up right” or “down right”. Calculate the optimum cost and path from point A to point B.



2. The difference equation describing a system is

$$x_{k+1} = ax_k + bu_k, \quad a, b \text{ constants.}$$

By using dynamic programming calculate the controls $u[k]$, $k = 1, 2, 3$, which minimize the cost

$$J = \sum_{k=1}^3 [x_k^2 + ru_k^2], \quad r \text{ constant.}$$

when

- a) x_4 is free.
- b) $x_4 = 0$.