Department of Industrial Engineering & Operations Research

IEOR 162 Linear Programming & Network Flows (Spring 2022)

Shortest paths application: Equipment replacement

A single machine is needed to perform a specified function for the next four years, after which the function and machine will no longer be needed. The purchase price of a machine varies over the next four years according to the following table.

Year	Now	One Year From now	Two Years From now	Three Years From now
Purchase price	\$25,000	\$33,000	\$38,000	\$47,000

The salvage value of a machine depends only on its length of service and is given by the following table.

Length of Service	One Year	Two Years	Three Years	Four Years
Salvage Value	\$17,000	\$6,000	\$3,000	\$1,000

The annual operating cost varies with length of service, as follows.

Length of Service	New	One Year	Two Years	Three Years
Annual operating cost	\$3,000	\$5,000	\$8,000	\$18,000

Construct a network in which the shortest path will yield an optimal policy of purchasing, operating, and salvaging machines over the next four years if management wishes to minimize the total cost.

Iteration	Node 1	Node 2	Node 3	Node 4	Node 5
1	0	∞	∞	∞	∞
2					
3					
4					
5					