Resource Allocation Problem using Dynamic Programming

A resource allocation problem in which "n" resource are to be allocated "m" projects. If "j" resources allocated to "i" projects, the profit P(i,j) earned.

The problem is to allocate resource to "m" project such that the total profit is maximized.

Terminology used

V(i,j): Benefit obtained upto State "i" by using "j" resource.

E(m,n): Profit obtained by spending "n" resource on "m" project.

Example

Resource = 4 billion

Projects = 3

Project \ Resource	0	1	2	3	4
0	0	6	8	8	10
1	0	5	11	16	17
2	0	1	4	5	6

Solution is Invest 3 billion on project 1 ⇒ Profit earned = 16

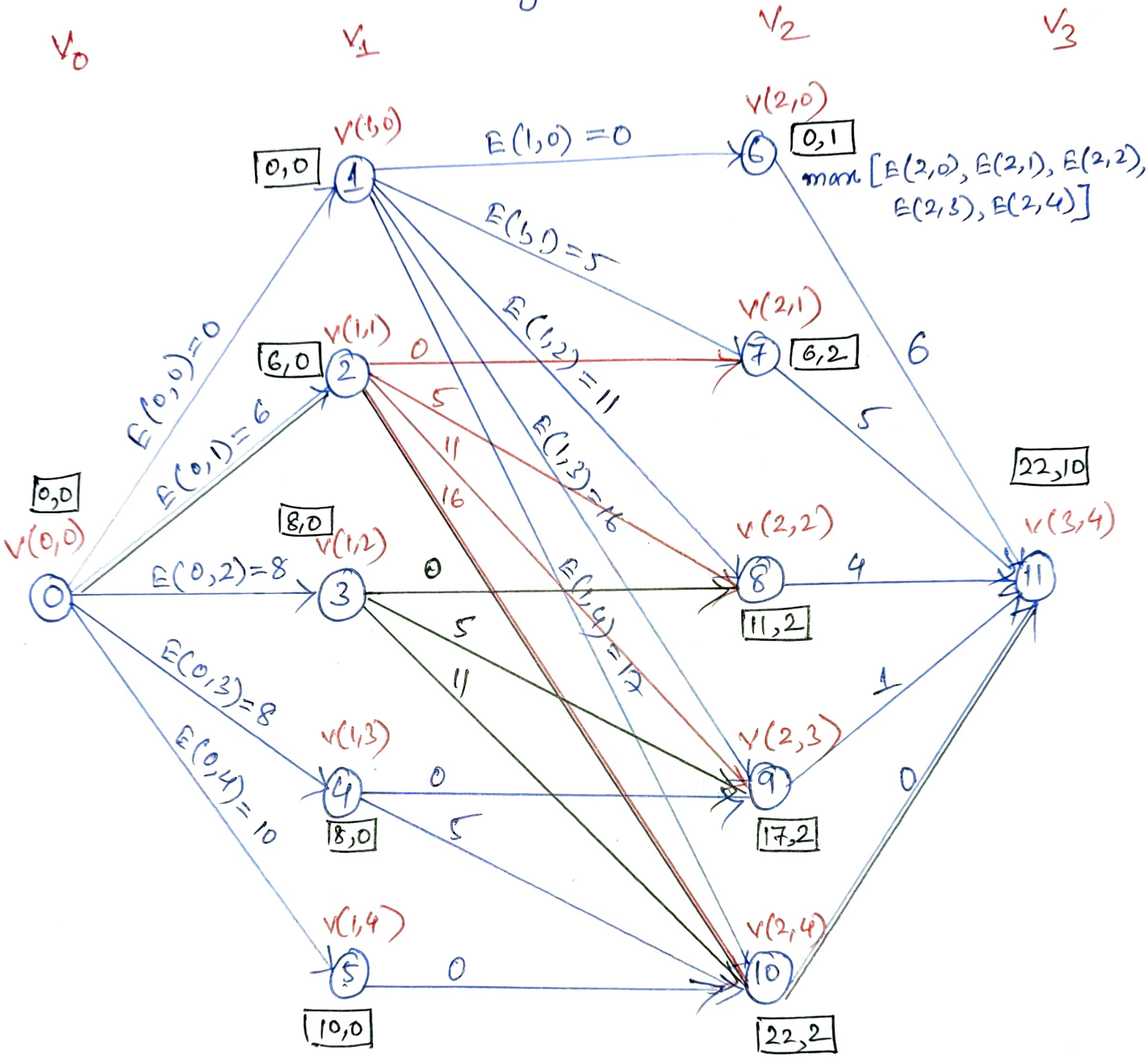
Invest 1 billion on project 0 ⇒ Profit earned = 5

Total profit earned = 22

We use Multi-stage graph to solve this problem.

Here, we have 3 projects

$\therefore$ 3+1 = 4 stages.



1 Resource on Project 0

3 Resource on project 1

$\therefore$ Total profit = 6+16 = 22