

IEGR 350: Engineering Economy

Spring 2016

M. Salimian

Quiz 1: 100 Points

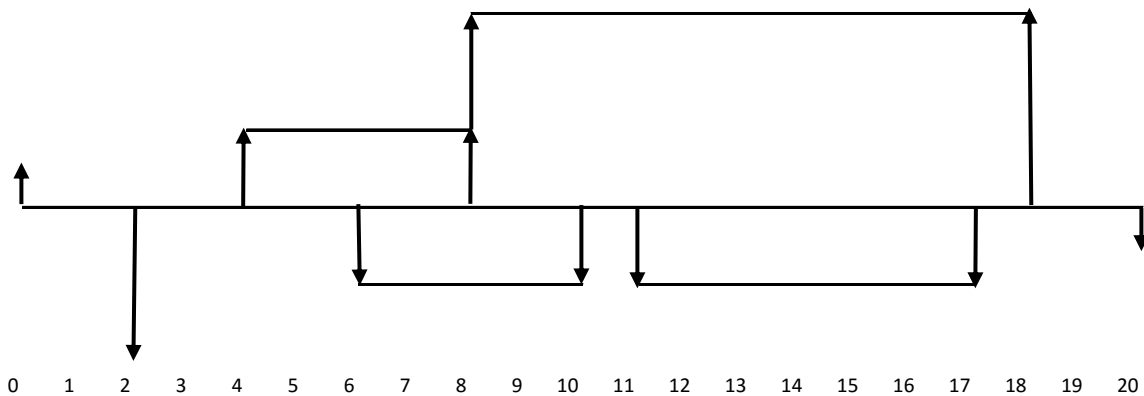
Name:

Time: 25 Minutes

Each vertical grid represents one year and each horizontal grid \$13.

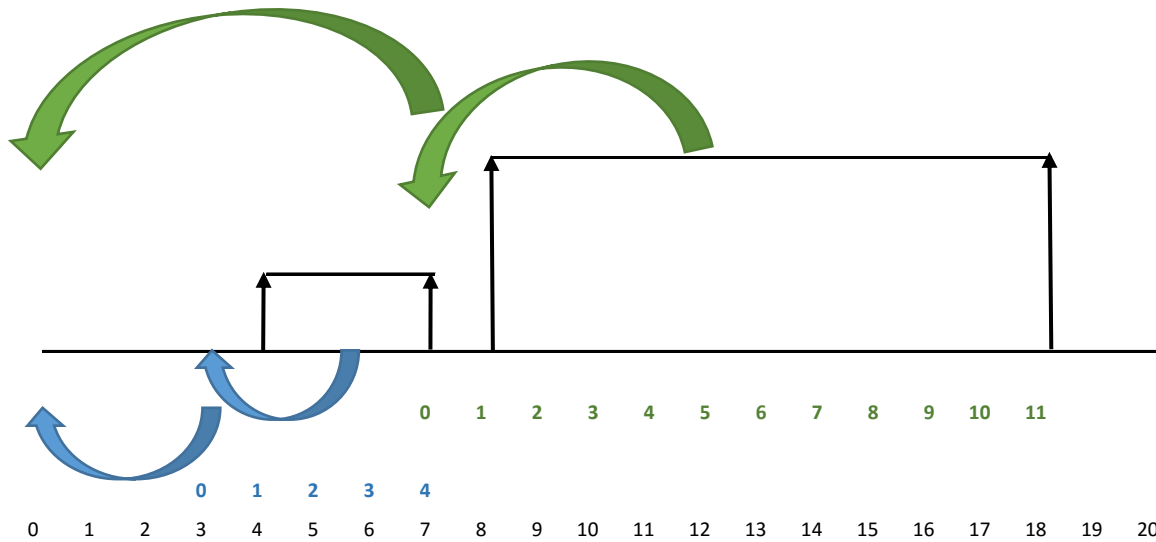
PROBLEM: Given the cashflow and for the interest rate of 15% compounded annually, perform the following steps:

1. Using table, calculate the worth of project, as it is, at the end of year 13. (70 pts)
2. Calculate the equivalent annual series between years 3 and 10 for the entire project. (30 pts)
(Hint: you can use the value calculated in part 1.)



Since we are told to use the cashflow as it is and find the value of the project as a single value at the end of year 13, we can proceed by finding the present worth of the project at year 0 and then find the future worth of that amount at year 13.

To do that, first we need to resolve the two positive payments at year 8 and assign it to one of the series. It make more sense to assign it to 2nd series.



$$PW1 = 5 (P/A, 15\%, 11)(P/F, 15\%, 7)$$

$$PW1 = 5 (5.2337) (0.3759) = 9.84$$

$$PW2 = 2 (P/A, 15\%, 4)(P/F, 15\%, 3)$$

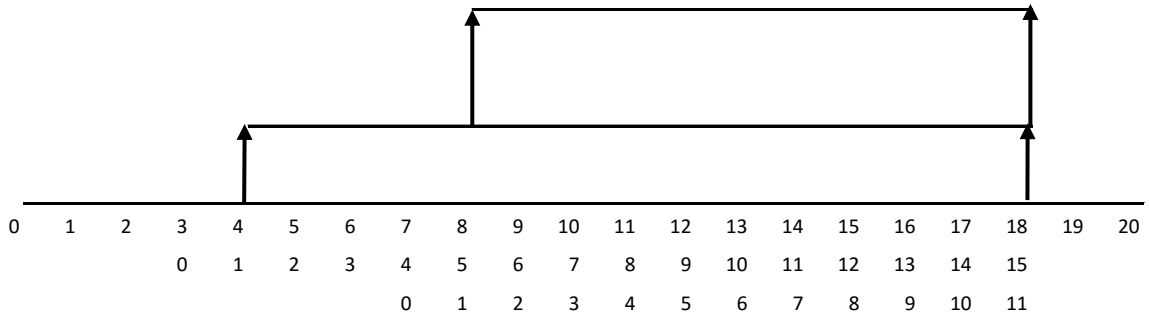
$$PW2 = 2 (2.8550) (0.6575) = 3.75$$

Note that we could have used the following design that will have these calculations:

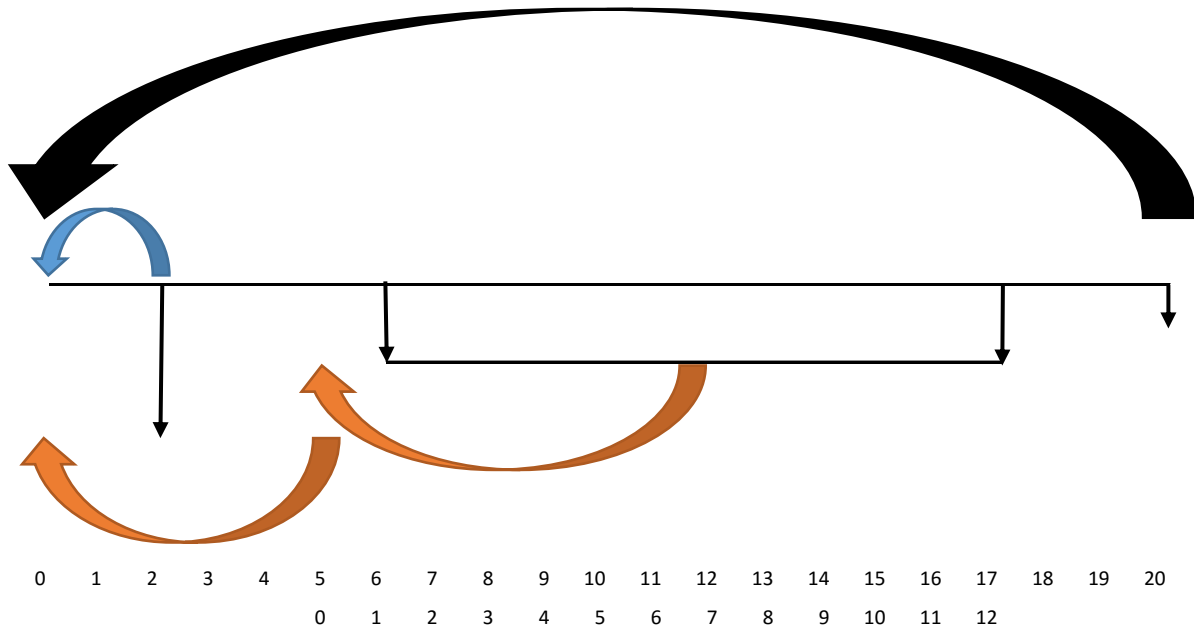
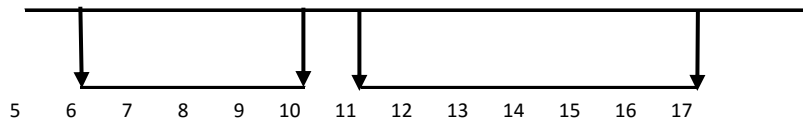
$$PW1 = 2 (P/A, 15\%, 15) (P/F, 15\%, 3) = 2 (5.8474) (0.6575) = 7.69$$

$$PW2 = 3 (P/A, 15\%, 11) (P/F, 15\%, 7) = 3 (5.2337) (0.3759) = 5.90$$

were $7.69 + 5.90 = 13.59$ is similar to $9.84 + 3.75 = 13.59$ that was calculated above.



Note that these two payments are only one continuous equal annual payment between years 6 and 17 and that is what we are going to use.



$$PW3 = -4 (P/F, 15\%, 2)$$

$$PW3 = -4 (0.7561) = -3.02$$

$$PW4 = -2 (P/A, 15\%, 12)(P/F, 15\%, 5)$$

$$PW4 = -2 (5.4206) (0.4972) = -5.39$$

$$PW5 = -1 (P/F, 15\%, 20)$$

$$PW3 = -1 (0.0611) = -0.06$$

Present worth calculations at year 0:

$$PW = 1 + PW1 + PW2 + PW3 + PW4 + PW5$$

$$PW = 1 + 9.84 + 3.75 - 3.02 - 5.39 - 0.06 = 6.12$$

To calculate the worth of project at the end of year 13, we find the future value of the calculated present worth at year 13.

The the equivalent worth of project as a single payment will be :

$$6.12 (F/P, 15\%, 13) = 6.12 (6.1528) = 37.66 \text{ grids}$$

$$\text{or, } \$13 (37.66) = \$489.58$$

To calculate the equivalent annual series between years 3 and 10 for the entire project we use the calculated present worth at year 0, find its future equivalent in year 2 and the equivalent annuities for that value over years 3 to 10.

$$FW (\text{at year } 2) = 6.12 (F/P, 15\%, 2) = 6.12 (1.3225) = 8.09$$

Based on this value (acting as present worth for the annuity), we will find A.

$$A = 8.09 (A/P, 15\%, 8) = 8.09 (0.2229) = 1.80 \text{ grids .}$$

$$\text{or, } \$13 (1.80) = \$23.40$$

