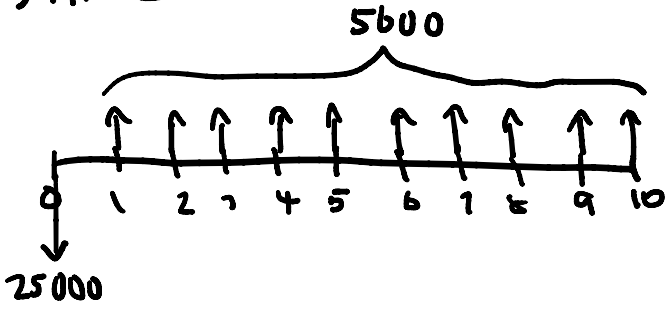
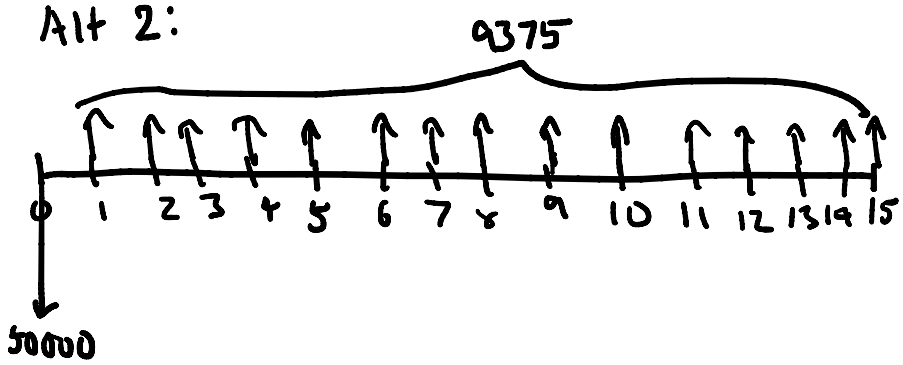
ECE 192 W2022 Midterm

1. a) Alt 1:



Alt 2:



b) Alt 1: $PP = \frac{\text{First cost}}{\text{Annual rate}} = \frac{25000}{5600} \approx 4.46$ years

Alt 2: $PP = \frac{\text{First cost}}{\text{Annual rate}} = \frac{50000}{9375} = 5.33$ years

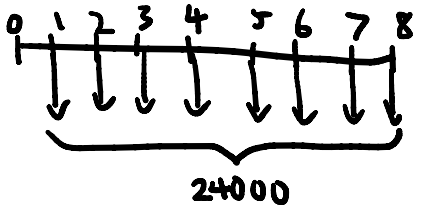
c) We adjust the service life of each so they are the same - 30 years

Alt 1: NPW = -25000(1 + (P/F, 9%, 10) + (P/F, 9%, 20)) + 5600(P/A, 9%, 30)
= -25000(1 + 0.4224 + 0.1784) + 5600(10.274)
= -40020 + 57534.4
= 17514.4

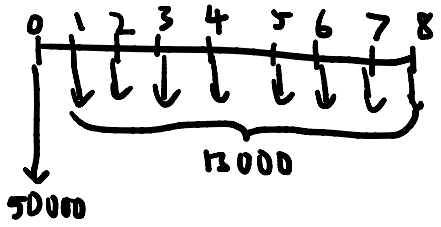
Alt 2: NPW = -50000(1 + (P/F, 9%, 15)) + 9375(P/A, 9%, 30)
= -50000(1 + 0.2745) + 9375(10.274)
= -63725 + 96318.75
= 32593.75

d) Alternative 2 is better. Even though it has a slightly higher payback period, its net present worth is much greater than Alternative 1.

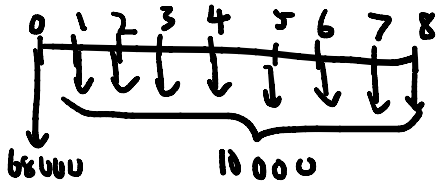
2. a) DN:



Alt 1:



Alt 2:



b) (Note: Should compare Alt 1 first but the method is the same and I'm lazy). We first compare Alternative 2 with Do Nothing. We use the IRR method, since there is a standard cashflow. The service lives of every alternative are the same.

$$0 = -68000 - (10000 - 24000)(P/A, i^*, 8)$$

$$4.857 = \frac{(1+i^*)^8 - 1}{i^*(1+i^*)^8} = (P/A, i^*, 8)$$

$$(P/A, 15\%, 8) = 4.487$$

$$(P/A, 12\%, 8) = 4.968$$

Interpolation:

$$\frac{4.968 - 4.487}{15\% - 12\%} = \frac{4.857 - 4.487}{i^* - 12\%}$$

$$i^* = 14.28\% > 12\%$$

We discard the Do Nothing alternative, and compare Alternative 2 with Alternative 1. We use the IRR method, since there is a standard cashflow.

$$0 = (-68000 + 50000) - (10000 - 13000)(P/A, i^*, 8)$$

$$0 = (-65000 + 50000) - (10000 - 13000)(P/A, i^*, 8)$$

$$6 = \frac{(1+i^*)^8 - 1}{i^*(1+i^*)^8} = (P/A, i^*, 8)$$

$$(P/A, 6\%, 8) = 6.210$$

$$(P/A, 7\%, 8) = 5.971$$

Interpolation:

$$\frac{6.21 - 5.971}{7\% - 6\%} = \frac{6 - 5.971}{i^* - 6\%}$$

$$i^* = 6.12\% < 12\%$$

By the IRR method, Alternative 1 is the best choice.