

No 1

1.	0. Annual Worth Analysis.
	$\text{Proj A} \quad \begin{matrix} \text{0.2013} & & \text{2.374} & \text{0.0813} \\ \text{AW}_A = -350k \left(\frac{A}{P}, 12\%, 8 \right) + 70k + 10k \left(\frac{F}{A}, 12\%, 3 \right) \left(\frac{A}{F}, 12\%, 8 \right) \\ = \$2,288 \end{matrix}$
	$\text{Proj B} \quad \begin{matrix} \text{0.2013} & & \text{893} & \text{0.2013} \\ \text{AW}_B = -360k \left(\frac{A}{P}, 12\%, 8 \right) + 50k + 20k \left(\frac{P}{G}, 12\%, 6 \right) \left(\frac{1}{1.12} \right)^2 \left(\frac{A}{P}, 12\%, 8 \right) \\ = \$6,193 \end{matrix}$
	$\text{Proj C} \quad \begin{matrix} \text{0.2013} & & \text{2913} & \text{0.0813} \\ \text{AW}_C = -320k \left(\frac{A}{P}, 12\%, 8 \right) + 100k - 10k \left(\frac{A}{G}, 12\%, 8 \right) - 20k \left(\frac{A}{F}, 12\%, 8 \right) \\ = \$4,828 \end{matrix}$
	Thus, Project B is chosen.

b) Study Period Approach is an approach used under the situation of different-life alternatives projects. Study Period Approach takes finite and identical study period in comparing alternatives.

Example of 'Study Period Approach' Application:

- 7 and 13 years alternatives multiple in LCM method would mean the span of 91 years, the LCM method is invalid here due to the long period.
- There is a specified period of equipment usage.

The downside of using study period approach is the need to estimate the market value of the alternative at some point prior to the end of the useful lives.

c) Cost of capital is the cost incurred by a company in sourcing for the funding of the projects. Cost of capital can be categorized into cost of debt and cost of equity. Cost of debt is the cost incurred in borrowing funds from external sources, whereas cost of equity is the funding stream from company's internal fund.

No 2

2 a. If 16 or wants principal withdrawal

$$PV = \frac{8,000}{0.0101} \quad IRR = \left(1 + \frac{0.01}{2}\right)^2 - 1$$
$$= \$178,019.8 \quad = 0.0101$$
$$FV_{16} = \frac{178,019.8}{(1.0101)^8}$$
$$= \$138,645.42$$
$$FV = PV(1+i)^6$$
$$138,645.42 = 100,000(1+i)^6$$
$$i = 5.6\%_{yr}$$

b. Not 'Cost-only alternative' → Thus 'Do-Nothing' option considered.

Given that IRR of project A is 7%.

$$-20,000 + Y \left(\frac{P}{A}, 7\%, 6\right) = 0$$
$$-20,000 + Y(4.767) = 0$$
$$Y = 4195.51$$
$$-(X - 20,000) + (7,800 - 4195.51) \left(\frac{P}{A}, 8.37\%, 6\right) = 0$$
$$X = \$36,502.44$$

'Do Nothing' & 'Project B'

$$-(X) + 7,800 \left(\frac{P}{A}, i\%, 6\right) = 0$$
$$i = 7.6\% < MARR = 8\% \rightarrow \text{Thus Do Nothing alternative is chosen.}$$

No 3

a. Income Tax

From the viewpoint of economic evaluation of capital investment projects, income tax is incurred on the taxable income, which is an amount after deducting tax deductible (eg. Depreciation) and filed to IRS.

Sometimes, when a company incurred losses in the project (ie. Income tax), the effect of income tax may vary depending on country's policy. For an entity with only one project or income stream, the losses reflected in negative income tax, may either mean the entity does not need to pay income tax. On the other hand, for entities with more than one projects, losses in one project would mean deduction to

overall taxable income, resulted in lesser income tax paid. Thus, making the loss in the particular project less significant.

Capital Gains Tax

Capital gains tax is incurred when the net realized value of asset at disposal is greater than the book value of asset. Capital gains tax will decrease the value of the project, the supposedly higher capital gain of equipment is deducted by the tax.

b.

Accelerated method of depreciation

The accelerated method of depreciation increases the depreciation amount in the earlier years. This helps the project to be valued higher, due to the less tax paid to authority. Although some may argue that eventually the total depreciation amount paid will be the same regardless of time value of money involved, it is because of every equipment does not last for a lifetime that makes accelerated method to be more beneficial than the normal depreciation method.

In after-tax engineering economic analysis with inflation considered, depreciation is not adjusted for inflation. The reason is that this process complicates accounting procedure, and it is not allowed by income-tax authorities.

c.

The very fundamental assumption in preferred stock is the stock will be held to perpetuity. The valuation of preferred stock is by discounting the cashflow (ie. Dividend) for perpetuity.

$$Vp = \frac{D}{K}$$

For potential investor, if they are purchasing preference stock, they will not have voting rights in the company meeting. Another risk is the price fluctuation risk, because of the fixed dividend rate, it is affected by interest rate fluctuation and thus affect its price. Preference stock also carries liquidation risk. If a company is liquidated, it must pay all of its creditors first, and then bondholders, before preferred stockholders claim any assets.

d. Operating income in income statement is reflected by the equation of gross margin – operating expenses. This is the revenue generated from operations. Operating income reflect the profitability of the company's business. A strong operating income should show constant or even exponential growth from its operation. Potential lenders and investors would measure the growth of the company based on its future prospect reflected in its operating income. If the YoY operating income is decreasing, this would mean the company has a profitability problem that need to be solved for it to continue its operation.

4.

a. Economic life of equipment is the minimum cost life. The ideally correct life of equipment should correspond to least EUAC (Equivalent Uniform Annual Cost). The EUAC of a particular year is equivalent to the Capital Recovery and the EUOM (Equivalent Uniform O&M Costs). The least EUAC would mean the least cost incurred to the company by the equipment.

The replacement economy compares the option of extending service of existing equipment or acquiring new equipment. The former is called defender, whereas the later is challenger. The replacement economy is based on the scenario of having the decision made at the point. It compares the EUAC between two options and choose the one with the least EUAC.

b.

4 b. $(CR)_n = -60,000 \left(\frac{A}{P}, 15\%, n\right) + Sn \left(\frac{A}{F}, 15\%, n\right)$

Yr 1.
 $CR = -25,000$ $EUOM = 12,000$ $EUAC = CR + EUOM$
 $= -37,000$

Yr 2.
 $CR = -25,278.5$ $EUOM = 12k + 2k \left(\frac{A}{F}, 15\%, 2\right)$ $EUAC = -25,278.5 - 12,930$
 $= 12,930$ $= -38,208.5$

Yr 3.
 $CR = -20,520$ $EUOM = 12k + 2k \left(\frac{A}{F}, 15\%, 3\right) + 0.5 \left(\frac{A}{F}, 15\%, 3\right)$ $EUAC = \$ -34,478$
 $= 13,958$

Yr 4.
 $CR = -19,215.3$ $EUOM = 12k + 2k \left(\frac{A}{F}, 15\%, 3\right) \left(\frac{A}{P}, 15\%, 4\right) + 0.5(1.15) \left(\frac{A}{F}, 15\%, 4\right) + 9k \left(\frac{A}{F}, 15\%, 4\right)$ $EUAC = -34,584.3$
 $= 15,369$

Thus, economic life is 3 Years. due least EUAC