

TIE2140 Engineering Economy
Tutorial #2 (Financial Analysis of Single Project)

Question 1 (based Sullivan *et al* 2014, P5-4)

Evaluate a combined cycle power plant on the basis of the *PW* method when the *MARR* is 12% per year. Relevant data are as follows:

Investment cost	\$ 13,000,000
Useful life	15 years
Market value at end of useful life	\$ 3,000,000
Annual operating expenses	\$ 1,000,000
Overhaul cost – end of 5 th year	\$ 200,000
Overhaul cost – end of 10 th year	\$ 550,000

Question 2 (based Sullivan *et al* 2014, P5-21)

Determine the *FW* of the following engineering project when the *MARR* is 15% per year. Is the project acceptable?

Investment Cost	\$10,000
Expected life	5 years
Salvage value*	- \$1,000
Annual receipts	\$8,000
Annual expenses	\$4,000

* a negative *SV* means that there is a net cost to dispose of an asset.

Question 3 (based Sullivan *et al* 2020, P5-27)

A company is considering constructing a plant to manufacture a proposed new product. The land costs \$300,000, the building costs \$600,000, the equipment costs \$250,000 and \$100,000 additional working capital is required. It is expected that the product will result in sales of \$750,000 per year for 10 years, at which time the land can be sold for \$400,000, the building for \$350,000, and the equipment for \$50,000. All of the working capital would be recovered at the end of year 10. The annual expenses for labor, materials; and all other items are estimated to total \$475,000. If the company requires a *MARR* of 15% per year on projects of comparable risk, determine if it should invest in the new product line. Use the *AW* method.

Question 4 (based Sullivan *et al* 2020, P5-49)

In this problem, we consider replacing an existing electric water heater with an array of solar panels. The net installed investment cost of the panels is \$1,400 (\$2,000 less a 30% rebate from the government's green energy incentive scheme). Based on an energy audit, the existing water heater uses 200 kWh of electricity per month, so at \$0.12 per kWh, the cost of operating the water heater is \$24 per month. Assume that the solar panels can save the entire cost of heating water with electricity, and have a useful life of 7 years with negligible salvage value.

- (a) What is the discounted payback period for the solar panels if *MARR* is 3% per year compounded monthly?
- (b) What is the *IRR* of this investment?

Question 5 (based Sullivan *et al* 2014, P5-55)

The International Parcel Service has installed a new radio frequency identification (RFID) system to help reduce the number of packages that are incorrectly delivered. The capital investment in the system is \$65,000, and the project's annual savings are tabled below. The system's market value at the end of year 5 is negligible, and the *MARR* is 18% per year.

End of Year	Savings
1	\$25,000
2	30,000
3	30,000
4	40,000
5	46,000

- (a) What is the *FW* of this investment?
- (b) What the *IRR* of the system?
- (c) What is the *MIRR* of this investment if the financing rate is 12% and reinvestment rate is 18%?
- (d) What is the discounted payback period of this investment?