

Assignment I:

- Two receipts of \$1,000 each are desired at the EOYs 10 and 11. To make these receipts possible, four EOY annuity amounts will be deposited in a bank at EOYs 2, 3, 4, and 5. The bank's interest rate (i) is 12% per year.
 - Draw a cash-flow diagram for this situation.
 - Determine the value of A that establishes equivalence in your cash flow diagram.
 - Determine the lump-sum value at the end of year 11 of the compounded cash flow diagram based on your answers to Parts (a) and (b).
- A loan of \$15,000 requires monthly payment of \$477 over a 36-month period of time. These payments include both principal and interest.
 - What is the nominal interest rate (APR) for this loan?
 - What is the effective interest rate per year?
 - Determine the amount of unpaid loan principal after 20 months.
- Three mutually exclusive equipment alternatives are being considered. The estimated cash flows for each alternative are as follows:

	Caterpillar	Deere	Komatsu
Installed cost	\$40,000	\$30,000	\$20,000
Net Annual revenue	6,400	5,650	5,250
Market value at end of useful life	0	0	0
Useful life	20 years	20 years	20 years
IRR	15.0%	18.2%	22.9%

If MARR is 10% per year, which alternative (if any) should be chosen?

- Two mutually exclusive alternatives are being considered for the environmental protection equipment at a petroleum refinery. One of these alternatives must be selected. The estimated cash flows for each alternative are as follows:

	Alternative A	Alternative B
Capital Investment	\$20,000	\$38,000
Annual expenses	5,500	4,000
Market value at the end of useful life	1,000	4,200
Useful life	5 years	10 ears

Assume the study period is shortened to five years.

- Find the uniform annual amount that is equivalent to a uniform gradient series in which the first year's payment is \$500, the second year's payment is \$600, the third year's payment is \$700, and so on, and there is a total of 20 payments. The annual interest rate is 8%.
- For a repayment schedule that starts at EOY four at \$Z and proceeds for years 4 through 10 at \$2Z, \$3Z,, what is the value of Z if the principal of this loan is \$10,000 and the interest rate is 7% per year? Use a uniform gradient amount (G) in your solution.
- The heat loss through the exterior walls of a certain poultry processing plant is estimated to cost the owner \$3,000 next year. A salesman from Superfiber Insulation,

Inc., has told you, the plant engineer, that he can reduce the heat loss by 80% with the installation of \$18,000 worth of Superfiber now. If the cost of heat loss rises by \$200 per year (uniform gradient) after the next year and the owner plans to keep the present building for 15 more years, what would you recommend if the interest rate is 10% per year?

8. Your company has a \$100,000 loan for a new security system it just bought. The annual payment is \$8880 and the interest rate is 8% per year for 30 years. Your company decides that it can afford to pay \$10,000 per year. After how many payment will the loan be paid off?
9. Three mutually exclusive design alternatives are being considered. The estimated cash flows for each alternatives are given next. The MARR is 20% per year. At the conclusion of the useful life, the investment will be sold.

	A	B	C
Investment cost	\$28,000	\$55,000	\$40,000
Annual expenses	\$15,000	\$13,000	\$22,000
Annual revenues	\$23,000	\$28,000	\$32,000
Market value	\$6,000	\$8,000	\$10,000
Useful life	10 yrs	10 yrs	10 yrs
IRR	26.4%	24.7%	22.4%

Which alternative should be selected?

10. The following data have been estimated for two mutually exclusive investment alternatives, A & B. If MARR=10% per year, show which alternative is more desirable by using equivalent worth methods. Use repeatability assumption.

	A	B
Capital investment	\$3,500	\$5,000
Annual cash flow	1,255	1,480
Market value at end of useful life	0	0
Useful life (years)	4	6

11. The following cash flow estimates have been developed for two small, mutually exclusive investment alternatives:

End of Year	Alternative A	Alternative B
0	-\$2,500	-\$4,000
1	\$750	\$1,200
2	\$750	\$1,200
3	\$750	\$1,200
4	\$750	\$1,200
5	\$2,750	\$3,250

The MARR =12% per year.

What the AW of alternative 1?

What is the AW of alternative 2?

What is the AW of the incremental net cash flow?

Given your answers for parts a through c, which alternative should be selected?

12. Consider the following two mutually exclusive alternatives for reclaiming a deteriorating inner-city neighborhood (one of them must be chosen).

End of Year	Alternative X	Alternative Y
0	-\$100,000	-\$100,000
1	\$50,000	13. \$0
2	\$51,000	14. \$0
3	\$60,000	\$205,760
IRR	27.19%	27.19%

- If MARR is 15% per year, which alternative is better?
 - What is the IRR on the incremental cash flow i.e., $\Delta(Y - X)$?
 - If MARR is 27.5% per year, which alternative is better?
 - What is the simple payback period for each alternative?
 - Which alternative would you recommend?
15. A certain U.S. government savings bond can be purchased for \$7,500. This bond will be worth \$10,000 when it matures in 5 years. As an alternative, a 60-month certificate of deposit (CD) can be purchased for \$7,500 from a local bank, and the CD yields 6.25% per year. Which is the better investment if your personal MARR is 5% per year?
16. An environmentally friendly green home (99% air tight) cost about 8% more to construct than a conventional home. Most green homes can save 15% per year on energy expenses to heat and cool the dwelling. For a \$250,000 conventional home, how much would have to be saved in energy expenses per year when the life of the home is 30 years and the interest rate is 10% per year? Assume the additional cost of a green home has now value at the end of 30 years. (refer chap. 5)
17. A 50-kilowatt gas turbine has an investment cost of \$40,000. It costs another \$14,000 for shipping, insurance, site preparation, fuel lines, and fuel storage tanks. The operation and maintenance expenses for this turbine is \$450 per year. Additionally, the hourly fuel expense for running the turbine is \$7.50 per hour, and the turbine is expected to operate 3,000 hours each year. The cost of dismantling and disposing of the turbine at the end of its 8-year life is \$8,000.
- If the MARR=15% per year, what is the annual equivalent life cycle cost of the gas turbine?
 - What percent of annual life cycle cost is related to fuel?
18. Anderson County has 35 older-model school buses that will be salvaged for \$5,000 each. These buses cost \$144,000 per year for fuel and maintenance. Now the country will purchase 35 new school buses for \$40,000 each. They will travel an average of 2000 miles per day for a total of 360,000 mile per year. These new buses will save \$10,000 per year in fuel (compared with the older buses) for the entire group of 35 buses. If the new buses will be driven for 15 years and the county's MARR is 6% per year, what is equivalent uniform annual cost of the new buses if they have negligible market value after 15 years.
19. A small company purchased now for \$23,000 will lose \$1,200 each year the first four years. An additional \$8,000 invested in the company during the fourth year will result in a profit of \$5,500 each year from the fifth year through the fifteenth year. At the end of 15 years, the company can be sold for \$33,000.
- Determine IRR
 - Calculate the FW if MARR=12%
 - Calculate the ERR when E=12%

