ISyE 3025, Fall 2015, HW 2

1 a. Consider the sequence of cash flows given in the table. Find the net future value (NFV) at the end of period 22, using MARR = 10%.

End of period	0	1	2	3	4	5	6	7	8	...	22
Cash flow	-22,222	220	240	260	280	300	320	340	360	...	640

b. Consider the sequence of cash flows given in the table. Find the net future value (NFV) at the end of period 22, using MARR = 10%.

End of period	0	1	2	3	4	5	6	7	8	...	22
Cash flow	-22,222	220	210	200	190	180	320	340	360	...	640

c. What is the NPV and the NAV for parts (a) and (b) above?

2 a. Consider the sequence of cash flows given in the table. Find the net present value (NPV) of the cash flow, using MARR=15%.

End of period	0	1	2	3	4	5	6	...	24	25	26
Cash flow	-9900	600	590	580	570	560	550	...	370	360	1000

b. Consider the sequence of cash flows given in the table. Find the net present value (NPV) of the cash flow, using MARR.

End of period	0	1	2	3	4	5	6	...	24	25	26
Cash flow	-9900	200	300	400	500	500	500	...	500	500	-2000

c. What is the NFV and the NAV for parts (a) and (b) above?

3. You are presented with two mutually exclusive investment projects, A and B, as shown below. A choice of either one would require the corresponding initial investment now. If you accept a project, you will receive the annual cash inflow for the project life. Remember, you can always invest any extra cash in a fund that pays MARR per year. You currently have $6000 available to invest.

a. Compute the net future value (NFV) at the end of period 12 for each of the two projects, A and B, using a MARR=3.3%.

b. If you wish to maximize your cash amount at the end of the Planning period, which of the two projects, A or B, is the better choice? Explain numerically.

Investment project	A	B
Initial investment amount needed	4,000	4,500
Annual cash inflow during life	587	671
Project life, years	12	10

4 a. A project requires the purchase of equipment for $250,000. The salvage value of the equipment at the end of the project life (15 years) is expected to be $22,000. In addition, annual expenses for operation and maintenance are expected to be $25,000. Each year the project is expected to earn $100,000, except in the 6th year when the project is expected to earn $200,000. With MARR = 10%, find the equivalent uniform value (EUV) of this project. Pay attention to the signs of the cash flows.

b. The purchase cost, salvage value, and lifetime are the same as in part a. However, the O&M cost increases by $300 each year; the first-year O&M cost is the same as in part a. The MARR is the same. Find the EUV of this project.

5 a. You arrange to borrow $22,000 for home repairs. The loan will be repaid in 22 equal, annual payments. The loan payments are calculated using a nominal interest rate of 11%, compounded monthly. What is the amount of the yearly payment?

b. After you have committed yourself to the loan, the finance company informs you that there are some additional fees (transaction costs). These amount to $1000, and they are subtracted from the Original Amount that you receive. The annual payments, however, are based on Original Amount. What is the true interest rate of the loan, expressed as a nominal interest rate compounded monthly?

6. Below are data for five projects. The MARR = 10%. Each project has a lifetime of ten (10) years. There is a time 0 investment budget of $180,000. Projects identified by the same letter are mutually exclusive; two or more projects in the same group cannot be selected. Otherwise, combinations can be formed. In addition, project C1 cannot be selected unless A2 is also selected.

	Group A	Group A	Group B	Group B	Group C	Group C
Investment name	A1	A2	B1	B2	C1	C2
Investment at time 0	50,000	65,000	70,000	80,000	85,000	65,000
Net inflow/year	2,020	9,865	15,435	17,090	35,830	10,705

a. Which project(s) should be selected if there is no budget limit?

b. Which project(s) should be selected if there is a budget limit, as given above?

7. Find the IRR for the following cash flow, to the nearest tenth of a percentage.

Time	0	1	2	3	4	5	6	7
Cash flow	-2,000	500	600	220	55	700	550	625

8. There are two equipment alternatives for a manufacturing department: Models X and Y. Investment costs, salvage values, annual costs, and useful lifetimes in years are given below. Your firm plans to operate the manufacturing department for a long time. The same versions of each model will be available in the future, with the same costs and characteristics. Which is the preferred alternative, based on lower costs? MARR = 15%.

Investment X	Investment X	Salvage X	Salvage Y	Annual X	Annual Y	Lifetime X	Lifetime Y
9,000	16,000	800	5,000	1,900	2,200	3	8

9. Below are data for three mutually exclusive projects. The MARR = 10%. Each project has a lifetime of seven years.

Project	Investment at time 0	Net cash inflow/year
A	$40,000	$15,015
B	$30,000	$12,012
C	$60,000	$22,022

a. Use rate of return (IRR) to make the best decision regarding project selection.

b. What is the undiscounted payback period for each project? What is the discounted payback period for each project?

10. A medical organization is considering two mutually exclusive options for treatment of a chronic illness in a population of elderly patients. For each option there are initial outlays (for equipment and initial training) and annual expenses. Benefits are measured in terms of quality of life, and estimates have been made of the dollar value of such benefits. Each option has a lifetime of five years, after which new options will be considered based on the technology available then. The salvage value of the equipment at the end of the project is given in the table. The MARR is 5%.

Option	A	B
Investment	$500,000	$300,000
Annual cost to medical agency	$65,000	$35,000
Annual benefits to users	$280,000	$220,000
Salvage value	$200,000	$150,000

a. Determine which option, if any, should be selected using the benefit-cost ratio method.

b. Repeat part using IRR.

c. Repeat part (a) using NPV.

11. Consider the cash flow given below. MARR = 10%

time	0	1	2	3	4	5	6	7	8	9	10	11
cash flow	-500	220	220	-140	220	-110	-110	220	220	220	220	220

a. Find the undiscounted payback period.

b. Find the discounted payback period.

12. Consider the cash flow series below (all costs), which has a 3-year cycle that, once it begins, repeats forever. With MARR = 20%, how much would need to be deposited at time zero to meet these costs?

time	0	1	2	3	4	5	6	7	8	9	10 and on
cost	-	-	-	-	100	180	220	100	180	220	repeat cycle