

GE 348

ENGINEERING ECONOMICS

MIDTERM

FEBRUARY, 1997

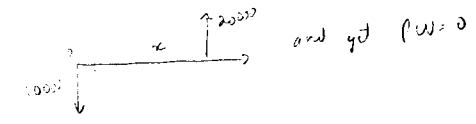
- Open textbook
- One 8 1/2" x 11" sheet of notes
- Neatness counts a lot!
- Show all work in design note format

Question	Marks	Marks Obtained
1	10	10
2	10	10
3	15	15
4	15	10
5	25	25
6	25	25
	100%	95

NAME: Reid von Melle

STUDENT #: 200616

1. At an interest rate of 8%, how long will it take a \$10,000 single payment to double in amount?



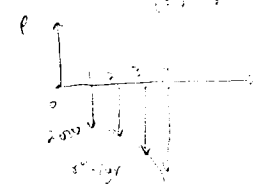
(10)

Soln: $P_1(1+i)^n = F_2$
 $10000(1+0.08)^n = 20000$
 $(1.08)^n = 2 \quad n \ln(1.08) = \ln 2$
 $n = 9.01 \text{ years}$

9.01

Answer

2. Tuition costs are expected to inflate at the rate of 8 percent per year. The first year's tuition is due 1 year from now and will be \$2000. A fund is to be set up today to cover tuition costs for 4 years in an account that will earn interest at rate i . How large must the fund be if $i = 5\%$?



(10)

note: P is a payment into the fund while tuition is a payment out

Soln: Set $PW=0$ $P - A_1 \left[\frac{1 - (1+i)^{-n}}{i} \right] = 0$

$P = 2000 \left[\frac{1 - (1+0.05)^{-4}}{0.05 \cdot 1.08} \right]$

$P = 7951.84$

7951.84

Answer

Name: Peter van Nulle

Student Number: 200516

Name: Peter van Nulle

Student Number: 200616

3. For a finance charge stated as 1.75 percent per month, what are the corresponding nominal and effective interest rates?

nominal rate = $(1.75) \times 12 = 21\%$

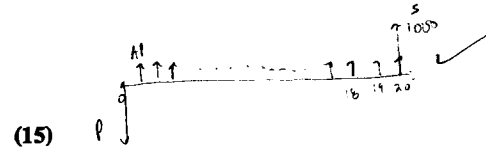
effective rate = $(1 + 1.75\%)^{12} - 1 = (1 + 0.0175)^{12} - 1 = 23.14\%$

(15)

nominal: 21%
effective: 23.14%

a) 21.0%
b) 23.14%
Answer

4. A 10-year corporate bond has a face value of \$1000 and a coupon rate of 8 percent payable semiannually. A prospective buyer desires to earn a nominal rate of 12 percent on investments. What purchase price would the buyer be willing to pay?



Annual payment: $A = 1000 \left(\frac{0.08}{2} \right) = 40$

set $PW = 0$ to find breakeven at $MARR = 12\%$

$-P + A \left[\frac{(1+i)^n - 1}{i(1+i)^n} \right] + \frac{1000}{(1+i)^n} = 0$

$-P + 40 \left[\frac{(1+0.06)^{20} - 1}{0.06(1+0.06)^{20}} \right] + \frac{1000}{(1+0.12)^{10}} = 0$

$P = 780.77$

780.77
Answer

5.

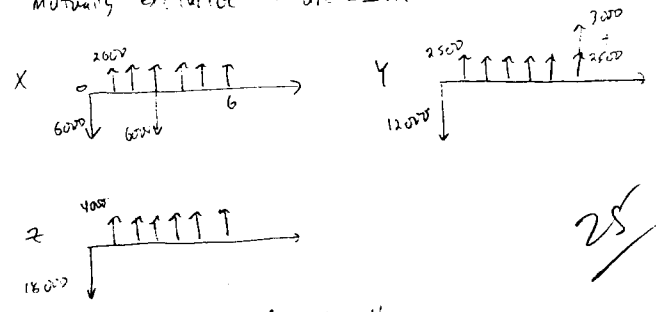
Data for three alternative investment plans are listed below.

Alternative	Investment	Salvage Value	Life, Years	Annual Net Cash Flow
X	\$6,000	\$0	3	\$2600
Y	12,000	3000	6	2500
Z	18,000	0	6	4000

When the minimum attractive rate of return is 10 percent, which alternative should be selected if the individual alternatives are mutually exclusive?

Mutually exclusive \Rightarrow use IIRB

(25)



set $PW = 0$ in all cases

$IIR_{0 \rightarrow X}: -6000 + 2600 \left[\frac{(1+i)^3 - 1}{i(1+i)^3} \right] - 6000(1+i)^{-3} = PW$

try $i = 10\%$ $PW = 815.79 > 0 \therefore IIR_{0 \rightarrow X}$ is $>$ $MARR$ so take

$IIR_{X \rightarrow Y}: -6000 - 1000 \left[\frac{(1+i)^6 - 1}{i(1+i)^6} \right] + 6000(1+i)^{-3} + 3000(1+i)^{-6} = PW$

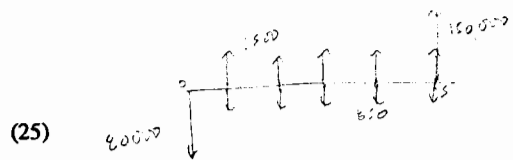
try $i = 10\%$ $PW = -274.22 < 0 \therefore IIR_{X \rightarrow Y}$ is $<$ $MARR$ so keep X

$IIR_{X \rightarrow Z}: -12000 + 1400 \left[\frac{(1+i)^6 - 1}{i(1+i)^6} \right] + 6000(1+i)^{-3} = PW$

try $i = 10\%$ $PW = -1394.75 < 0$
 $\therefore IIR_{X \rightarrow Z} < MARR$ so keep X

X
Answer

6. A parcel of land adjacent to a proposed highway exit is deemed likely to increase in value. It can be purchased now for \$80,000 and is expected to be worth \$150,000 within 5 years. During that period it can be rented for pasture at \$1500 per year. Annual taxes are presently \$850 and will likely remain constant. What rate of return will be earned on the investment if the estimates are accurate?



Find rate of return

set $PW = 0$ if possible

annual income = $1500 - 850 = 650$

$$-80,000 + 650 P(P/A, i, 5) + 150,000 P(P/F, i, 5) = PW$$

$$-80,000 + 650 \left[\frac{(1+i)^5 - 1}{i(1+i)^5} \right] + 150,000 (1+i)^{-5} = PW$$

try $i = 20\%$ $PW = \text{negative}$

try $i = 10\%$ $PW = \text{positive}$

note solve $-80,000 + 150,000 (1+i)^{-5} = 0$ first as a guess
 $\Rightarrow i = 13.4\%$

try $i = 13.4\%$ $PW = \text{positive}$

try $i = 13.5\%$ $PW = \text{positive}$

try $i = 13.7\%$ $PW = \text{positive}$

try $i = 14\%$ $PW = 134.6$

try $i = 14.1\%$ $PW = -207$

14%

Answer

Bonus Question - Wealthy Barber

5% In point form, outline the principles recommended in the Wealthy Barber to financial independence.

- Dollar cost averaging - buy with same amount of money ✓
- Forced Savings ✓ get money taken out of account directly
- Insurance - only keep enough to sustain standard of living
 - don't keep any if you're single
 - decrease as you get old
- Real-estate is always a good long-term investment
- START EARLY ✓
- Always have a will
- Invest 10% of everything you make ✓
- Pay yourself first ✓
- Mutual funds are good and worth doing research into
- Equity outperforms debt \Rightarrow invest in a company rather than loan money
- Pay off high interest debt like credit cards \Rightarrow this is equivalent to making a good investment

Invest in Mutual Fund
 Invest in Real Estate
 Invest in Stocks
 Invest in Bonds
 Invest in Cash

4