Solutions to Midterm 2 Study Questions

#1) FALSE. If the project has a borrowing cash flow structure (positive cash flows followed by negative cash flows), IRR>d implies negative NPV. For example, assume d=10% and the project has $100 cash inflow now and $120 cash outflow next year. IRR=20% >10%=d but NPV(at 10%) = $100-$120x(1.1)^{-1}= -9.1<0.

#2)

discount rate		5%	
year		cashflow	discounted
	0	-25000	-25000
	1	-600	-571.43
	2	-600	-544.22
	3	-1100	-950.22
	4	-1100	-904.97
	5	11700	9167.26
		PV	-18803.58
		EUAC	-4343.15

#8) Adjust for inflation by using the factor (1.03)^2. You will need $21,218 in two years. Now apply the present value factor, which has to take account of the fact that 4% is an annual rate (interest rates are always quoted annually) compounded quarterly. The quarterly interest rate is 4%/4 = 1%. The present value factor is (1.01)^(-8) = 0.923483. Multiplying this by $21,218 produces the answer, $19,594.47.

#9) Here are some elements:

9.00% mortgage rate

0.8% monthly

30 years

$3,000 max monthly payment

$372,846 max principal

$17,000 can put down

5% % down

$340,000 max house price

which is the answer - the down payment is the limiting factor

6-31

Provide Autos
P = \$18,000, F = \$7,000, A = \$600/yr + 0.12/mile, n = 4 years

Pay Salesmen
0.30 x where x = miles driven
0.30 x = (\$18,000 – \$7,000) (A/P, 10%, 4) + \$7,000 (0.10) + \$600 + \$0.12 x
0.18 x = (\$11,000) (0.3155) + \$700 + \$600
= \$4,770

Miles Driven (x) = \$4,770/0.18 = <u>\$26,500</u>

6-32

EUAC Comparison
Gravity Plan
Initial Investment: = \$2.8 million (A/P, 10%, 40)
= \$2.8 million (0.1023) = \$286,400
Annual Operation and maintenance = \$10,000
Annual Cost = \$296,400

Pumping Plan
Initial Investment: = \$1.4 million (A/P, 10%, 20)
= \$1.4 million (0.1023) = \$143,200

Additional investment in 10th year:
= \$200,000 (P/F, 10%, 10) (A/P, 10%, 40)
= \$200,000 (0.3855) (0.1023) = \$7,890

Annual Operation and maintenance = \$25,000
Power Cost: = \$50,000 for 40 years = \$50,000

Additional Power Cost in last 30 years:
= \$50,000 (F/A, 10%, 30) (A/F, 10%, 40)
= \$50,000 (164.494) (0.00226) = \$18,590

Annual Cost = \$244,680

<u>Select the Pumping Plan.</u>

6-41

$EUAC_{gas}$ = (P – S) (A/P, i%, n) + SL + Annual Costs
= ($2,400 – $300) (A/P, 10%, 5) + $300 (0.10) + $1,200 + $300
= $2,100 (0.2638) + $30 + $1,500
= $2,084

$EUAC_{electr}$ = ($6,000 – $600) (A/P, 10%, 10) + $600 (0.10) + $750 + $50
= $5,400 (0.1627) + $60 + $800
= $1,739

Select the electric motor.

6-42

Annual Cost of Diesel Fuel = [$50,000 km/(35 km/liter)] × $0.48/liter = $685.71
Annual Cost of Gasoline = [$50,000 km/(28 km/liter)] × $0.51/1liter = $910.71

$EUAC_{diesel}$ = ($13,000 – $2,000) (A/P, 6%, 4) + $2,000 (0.06) + $685.71 fuel +
$300 repairs + $500 insurance
= $11,000 (0.2886) + $120 + $1,485.71
= $4,780.31

$EUAC_{gasoline}$ = ($12,000 – $3,000) (A/P, 6%, 3) + $3,000 (0.06) + $910.71 fuel +
$200 repairs + $500 insurance
= $5,157.61

The diesel taxi is more economical.

6-43

Machine A
EUAB – EUAC = – First Cost (A/P, 12%, 7)
– Maintenance & Operating Costs + Annual Benefit + Salvage Value (A/F, 12%, 7)
= –$15,000 (0.2191) – $1,600 + $8,000 + $3,000 (0.0991)
= $3,411

Machine B
EUAB – EUAC = – First Cost (A/P, 12%, 10)
– Maintenance & Operating Costs + Annual Benefit + Salvage Value (A/F, 12%, 10)
= –$25,000 (0.1770) – $400 + $13,000 + $6,000 (0.0570)
= $8,517
Choose Machine B to maximize (EUAB – EUAC).

14-16

Compute an equivalent i:

$i_{equivalent} = i' + f + (i')(f)$
$= 0.05 + 0.06 + (0.05)(0.06)$
$= 0.113$
$= 11.3\%$

Compute the PW of Benefits of the annuity:

PW of Benefits $= \$2,500\ (P/A, 11.3\%, 10)$
$= \$2,500\ [((1.113)^{10} - 1)/(0.113\ (1.113)^{10})]$
$= \$14,540$

Since the cost is $15,000, the benefits are less than the cost computed at a 5% real rate of return. Thus the actual real rate of return is less than 5% and the annuity should not be purchased.

14-17

$1 = 0.20\ (1.06)^n$
$\log\ (1/0.20) = n \log\ (1.06)$
$n =$ 27.62 years

14-18

Use $\$97,000\ (1 + 1\%)^n$, where f% = 7% and n = 15

$\$97,000\ (1 + 0.07)^{15} = \$97,000\ (F/P, 7\%, 15)$
$= \$97,000\ (2.759)$
$= \$268,000$

If there is 7% inflation per year, a $97,000 house today is equivalent to $268,000 15 years hence. But will one have "profited" from the inflation?

Whether one will profit from owning the house depends somewhat on an examination of the alternate use of the money. Only the differences between alternatives are relevant. If the alterate is a 5% savings account, neglecting income taxes, the profit from owning the house, rather than the savings account, would be: $268,000 − $97,000 (F/P, 5%, 15) = $66,300.

On the other hand, compared to an alternative investment at 7%, the profit is $0. And if the alternative investment is at 9% there is a loss. If "profit" means an enrichment, or being better off, then multiplying the price of everything does no enrich one in real terms.

14-28

(a) $F = \$2{,}500\ (1.10)^{50} = \underline{\$293{,}477}$ in A$ today

(b) R$ today in (−50) purchasing power $= \$293{,}477\ (P/F, 4\%, 50)$
$= \underline{\$41{,}296}$

14-29

(a) $PW = \$2{,}000\ (P/A, i_c, 8)$
$i_{combined} = i_{real} + f + (i_{real})(f) = 0.03 + 0.05 + (0.03)(0.05)$
$= \underline{0.0815}$
$PW = \$2{,}000\ (P/A, 8.15\%, 9) = \underline{\$11{,}428}$

(b) $PW = \$2{,}000\ (P/A, 3\%, 8) = \underline{\$14{,}040}$

14-30

Find PW of each plan over the next 5-year period.
$i_r = (i_c - f)/(1 + f) = (0.08 - 0.06)/1.06 = 1.19\%$

$PW(A) = \$50{,}000\ (P/A, 11.5\%, 5) = \$236{,}359$
$PW(B) = \$45{,}000\ (P/A, 8\%, 5) + \$2{,}500\ (P/G, 8\%, 5) = \$198{,}115$
$PW(C) = \$65{,}000\ (P/A, 1.19, 5)\ (P/F, 6\%, 5) = \$229{,}612$

Here we choose Company A's salary to maximize PW.