Assignment 02

1. Problem 1

If \$750 is deposited in a savings account at the beginning of each of 15 years, and the account earns 3.2% interest per year, how much will be in the account at the end of 15 years?

$F = \$750(F/A, 3.2\%, 15)$

$$F = 750 \times \frac{((1+0.032)^{15}-1)}{0.032}$$

$F = \$14155$

2. Problem 2

The following two sets of revenues (incoming cash flows) will be equivalent in terms of economic desirability if A has a certain value. Assuming an interest rate of 5% compounded annually applies, what is the value of A (rounded to the nearest dollar) that causes these two sets of revenues to be equal to firm receiving the revenues?

Year	Cash Flow Option 1	Cash Flow Option 2
1	+A	+150
2	+A	+300
3	+A	+450
4	+A	+600
5	0	+750

Option 1: $P_1 = A(P/A, 5\%, 4)$

Option 2: $P_2 = \$150(P/A, 5\%, 5) + \$150(P/G, 5\%, 5) = \$1885$

$P_1 = P_2 = A(P/A, 5\%, 4)$

$A = \$531.58 = \$532$

3. Problem 3

Pete borrows $41,000 to buy a car. He must repay the loan in 48 equal end-of-period monthly payments. Interest is calculated at 0.45% a month. Determine the following:

(a) The nominal annual interest rate, rounded to the nearest tenth of a percent

(b) The effective annual interest rate, rounded to the nearest tenth of a percent

(c) The amount of the monthly payment, rounded to the nearest dollar

(a)

$$r = i \times m$$

$$r = 0.45\% \times 12$$

$$r = 5.4\%$$

(b)

$$i_a = (1 + 0.0045)^{12} - 1$$

$$i_a = 5.5\%$$

(c)

$$A = \$41,000(A/P, 0.45\%, 48)$$

$$A = \$952$$

4. Problem 4

A man had to have the muffler replaced on his car. The repairman offered two alternatives. For \$400 he would install a muffler, which would be guaranteed to last for two years. For \$700 he would install a muffler guaranteed to last for four years. Assuming the present owner expects to keep the car for four more years, which muffler would you advise him to have installed, and how much would he save? Use an interest rate of 8% (apply this as a discount rate). Assume that the less expensive muffler would last only two years, and could be replaced by a muffler at the same cost.

Analysis Period: 4 years

Let X = Muffler that lasts 2 years

Let Y = Muffler that lasts 4 years

X

$PW = \$400 + \$400(P/F, 8\%, 2)$

Y

$PW = \$700$

Muffler Y (that lasts 4 years) is recommended, and by doing so he would also save about \$43.

5. Problem 5

A city has developed a plan to provide for future municipal water needs. The plan proposes an aqueduct that passes through 200 meters of tunnel in a nearby mountain. Two alternatives are being considered. The first proposes to build a full-capacity tunnel now for \$585,000. The second proposes to build a half-capacity tunnel now at a cost of \$380,000. This tunnel will meet the needs of the growing population for 20 years. A second half-capacity tunnel will be built 20 years later for the same cost. The maintenance cost of the tunnel lining for the full-capacity tunnel is \$37,000 every 10 years, and for each half-capacity tunnel it is \$32,000 every 10 years.

The friction losses in the half-capacity tunnel will be greater than in the full-capacity tunnel. The estimated additional pumping costs for each of the half-capacity tunnels will be \$2,500 a year. Assume an interest rate of 4%, to be used as the discount rate.

(a) What is the capitalized cost of each option? On this basis, which alternative should be selected?

(b) Instead of using an infinite analysis, pick an appropriate project life and calculate the net present worth of the two options. Which option would be selected?

(a) Cost of full tunnel:

$$PW_1 = \$585,000 + \frac{\$37,000(A/F, 4\%, 10)}{0.04} = \$662,044$$

Cost of first half-tunnel:

$$PW_2 = \$380,000 + \frac{\$32,000(A/F, 4\%, 10)}{0.04} + \frac{\$2,500}{0.04} = \$509,133$$

Cost of second half-tunnel:

$$2nd\ Tunnel : \$509132.76(P/F, 4\%, 20) = \$232,362$$

Total cost of the half-tunnels:

$$\$741,495$$

The full tunnel option should be selected.

(b) Analysis period: 40 years, covering the full lifespan of coverage for the half-tunnels.

Full Capacity Tunnels:

$= \$585,000 + \$37,000(A/F, 4\%, 10)(P/A, 4\%, 40)$

$= \$585,000 + \$37,000(0.083)(19.79)$

$= \$645,775$

Half-Capacity Tunnels:
First Decade:

$= \$380,000 + \$32,000(A/F, 4\%, 10)(P/A, 4\%, 20) + \$2,500(P/A, 4\%, 20)$

$= \$450,198$

Second Decade:

$= \$380,000(P/F, 4\%, 20) + (P/F, 4\%, 20)(2 \times \$32,000(A/F, 4\%, 10)(P/A, 4\%, 20)$
$+\$5,000(P/A, 4\%, 20))$

$= \$173,427 + 0.456[(72,445) + (67,952)]$

$= \$237,448$

Total Cost:

$= \$450,198 + \$237,448$

$= \$687,646$

The single tunnel option would be selected.

6. Problem 6

Sally deposited $200 per month into her savings account for 24 months. For the next five years, she made no deposits. Assume the first deposit took place at the end of month 1. What is the future worth in Sally's savings account at the end of seven years, if the account earned 5% annual interest, compounded monthly?

Monthly Annual Interest:

$$\frac{5}{12}\% = 0.47\%$$

Future Worth:

$$F = A \times (F/A, 0.47\%, 24) \times (F/P, 0.47\%, 60)$$

$$F = 200 \times 25.19 \times 1.28$$

$$F = \$6465$$