1. (30p) What value of X makes these two cash flows equivalent assuming an interest rate of 10%?

![Cash Flows Diagram]

2. (30p) Compute the value of F, if the interest rate is 8%, compounded quarterly.

![Cash Flows Diagram]

3. (20p) You are considering purchasing a piece of industrial equipment that costs $30,000. You decide to make a down payment in the amount of $5,000 and to borrow the remainder from a local bank at an interest rate of 9%, compounded monthly. The loan is to be paid off in 36 monthly installments. What is the amount of the monthly payment?

4. (20p) Find the net present worth of the following cash flow series at an interest rate of 10%.

<table>
<thead>
<tr>
<th>End of Period</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$100</td>
</tr>
<tr>
<td>1</td>
<td>-200</td>
</tr>
<tr>
<td>2</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>400</td>
</tr>
<tr>
<td>4</td>
<td>500</td>
</tr>
</tbody>
</table>
1. **Given:** cash flow series given, \( i = 10\% \), \( N = 5 \) years

**Find:** \( X \) that makes two cash flow series equivalent

**Approach:** Anything of this nature is to establish a base period for equivalence calculation. You can pick any time period, period 0 being most common, though. For example, if you pick \( n = 0 \) as your base period, then compute the equivalent \( P \) for both cash flow series, equate them, and solve for unknown \( X \).

**Present value for cash flow series 1:**
\[
P_1 = 100(P/ A,10\%,5) + 50(P/ F,10\%,3) + 50(P/ F,10\%,5)
\]
\[
P_1 = 100(3.7908) + 50(0.7513) + 50(0.6209) = 447.69
\]

**Present value for cash flow series 2:**
\[
P_2 = 100(P/ F,10\%,1) + X(P/ F,10\%,2) - X(P/ F,10\%,3) - 200(P/ F,10\%,4) + X(P/ F,10\%,5)
\]
\[
P_2 = 100(0.9091) + X(0.8264) - X(0.7513) - 200(0.6830) + X(0.6209) = 0.696X - 45.69
\]
\[
P_1 = P_2
\]
\[
447.69 = 0.696X - 45.69
\]
\[
X = 708.88
\]

(\(P/F\) Factors were taken from Textbook/Table/p.885)

2. **Given:** Annual payments \((A=500 and 1000, \text{ s. cash flow})\), \( r = 8\% \) compounded quarterly, and \( N = 5 \) years

**Find:** \( F \)

**Approach:** Since the payment period is annual, you need to find out the effective annual interest rate: Compounding period (quarterly) is not the same as the payment period (annual).

Effective interest rate per quarter \((i_c)\) :
\[
i_c = \left(\frac{r}{M}\right) = \frac{0.08}{4} = 0.02(2\%) \text{ per quarter}
\]
\[
i_p = i_c \left(1 + \frac{0.08}{4}\right)^4 - 1 = 0.082432(8.2432\%)
\]
\[
F = 500(F/ P,8.2432\%,5) + 500(F/ P,8.2432\%,4) + 1000(F/ P,8.2432\%,3) + 1000(F/ P,8.2432\%,2)
\]
\[
F = 500(1 + 0.082432)^5 + 500(1 + 0.082432)^4 + 1000(1 + 0.082432)^3 + 1000(1 + 0.082432)^2
\]
\[
F = 3869.27
\]

(\(F/P\) Factor taken from Textbook/Table 3.4)

3. **Given:** \( P=30000\) (purchase price) - \$5000(down payment) = \$25000

**Find:** \( A \) per month
\[
i = \left(\frac{r}{M}\right) = \frac{0.09}{12} = 0.0075(0.75\%)
\]
\[
A = 25000(A/ P,0.75\%,36) = 25000(0.0318) = 795
\]

\((A/P\) Factor was taken from Textbook/Table p.872)

4. **Given:** cash flow series, \( MARR = 10\% \)

**Find:** \( NPW(10\%) \)
\[
NPW(10\%) = -100 - 200(P/ F,10\%,1) + 300(P/ F,10\%,2) + 400(P/ F,10\%,3) + 500(P/ F,10\%,4)
\]
\[
NPW(10\%) = -100 - 200(0.9091) + 300(0.8264) + 400(0.7513) + 500(0.6830) = 608.12
\]

(\(P/F\) Factors were taken from Textbook/Table/p.885)