Problem 1

An interest rate equal to 7% compounded annually:

    (a) If $20,000 is borrowed for 5 years what total amount must be paid back?

    (b) How much of the total amount repaid represents interest?

$$F = \$20{,}000(1 + 0.07)^5 = \$20{,}000(1.402552) = \$28{,}051.03$$

The amount of interest is:

$$\$28{,}051.03$$
$$-\$20{,}000.00$$
$$\overline{\$8{,}051.03}$$

Problem 2

If you purchase a $300,000 machine 5 years in the future with an interest rate equal to 7% compounded annually. How much money is needed today?

$$P = \frac{\$300{,}000}{(1+0.07)^5} = \frac{\$300{,}000}{(1.402552)} = \$213{,}895.85$$

Problem 3

A piece of equipment is estimated to cost $86,000 new and to have a useful life of 5 years with a salvage value of $14,000. The company believes that a realistic MARR would be 10%. Taxes, insurance, and storage should amount to an additional 8%, which results in an overall cost of money of 10 + 8, or 18%. To recover ownership cost, what is the appropriate amount per hour that must be charged for the equipment usage if the expected use rate of the equipment is 1,200 hours per year?

*** SOLUTION***

$$A = 86{,}000\left[\frac{0.18(1+0.18)^5}{(1+0.18)^5 - 1}\right] - 14{,}000\left[\frac{0.18}{(1+0.18)^5 - 1}\right] = 86{,}000(0.3198) - 14{,}000(0.1398)$$

$$= \$25{,}545.60$$

Expected rate to be charged $= \dfrac{\$25{,}545.60}{1{,}200} = \$21.30$ per hour $\Leftarrow$

Problem 4

A contractor is considering the following three alternatives:

      a. Purchase a new microcomputer system for $15,000. The system is expected to last 6 years with salvage value of $1,000.

      b. Lease a new microcomputer system for $3,000 per year, payable in advance.

The system should last 6 years.
c. Purchase a used microcomputer system for $8,200. It is expected to last 3 years with no salvage value.

Use a common-multiple-of-lives approach. If MARR of 8% is used, which alternative should be selected using a discounted present worth analysis? If the MARR is 12%, which alternate should be selected?

SOLUTION

$$NPV_{\text{new purchase}} = -\$15,000 + \frac{\$1,000}{(1+0.08)^6} = -\$14,370$$

$$NPV_{\text{lease new}} = -\$3,000 - \$3,000 \times \left[\frac{(1+0.08)^6 - 1}{0.08(1+0.08)^6} \right] = -\$14,978$$

$$NPV_{\text{used purchase}} = -\$8,200 - \frac{\$8,200}{(1+0.08)^3} = -\$14,709$$

The "**purchase new**" alternative represents the least cost solution when the MARR is 8%.

If the MARR is 12% which alternate should be selected?

$$NPV_{\text{new purchase}} = -\$15,000 + \frac{\$1,000}{(1+0.12)^6} = -\$14,493$$

$$NPV_{\text{lease new}} = -\$3,000 - \$3,000 \times \left[\frac{(1+0.12)^6 - 1}{0.08(1+0.12)^6} \right] = -\$13,814$$

$$NPV_{\text{used purchase}} = -\$8,200 - \frac{\$8,200}{(1+0.12)^3} = -\$14,037$$

The "**lease new**" alternative represents the least cost solution when the MARR is 12%.