Practice Problems:

1. Lubbock County is planning to construct a bridge across the Rio de Lubbock to facilitate afternoon skiing in the El Dusto Ski Basin. The first cost for the bridge will amount to $6,500,000. Annual maintenance and repairs will amount to $25,000 for each of the first five years, to $30,000 for each of the next ten years and to $35,000 for each of the next five years. In addition a major overhaul costing $500,000 will be required at the end of the tenth year. Use an interest rate of 5% and determine the equivalent uniform annual cost for a 20-year period.

Solution:

i = 5%. n = 20 Years. P = $6,500,000.
Annual Maintenance Cost for the first five years, A_1 = $25,000.
Annual Maintenance Cost from year 6 thro' 15, A2 = $30,000.
Annual Maintenance Cost from year 16 thro' 20, A_3 = $35,000.
Overhaul Costs = $500,000 at year 10.

EUAC = [6,500,000 + 500,000 (P/F, 5%, 10)] (A/P, 5%, 20) +
25,000 +[{5000 (F/A, 5%, 5) + 5000(F/A, 5%, 15)} (A/F, 5%, 20)]
= [6,500,000 + 500,000 (0.6139)] (0.0802) +
25,000 +[{5000 (5.526) + 5000 (21.579)}(0.0302)]
= 545,917.39 + 29,092.86 = $575,010.25

2. Given 2 alternatives:

	A	**B**
First cost	$4,000	$6,000
Annual cost	1,000	500
Annual benefit	2,000	2,200
Life, years	4	10
Salvage	3,000	1,000

Assuming that alternatives are replaced at the end of their useful life, determine the better alternative using annual cash flow analysis at an interest rate of 9%.

Solution:

Need to look at one life cycle of each alternative.
EUAB – EUAC (Alt. A) = {(2,000 – 1,000) + 3,000 (A/F, 9%, 4)}- 4,000 (A/P, 9%, 4)
= {1,000 +3,000(0.2155)}- 4,000(0.3155) = $384.5
EUAB – EUAC (Alt. B) = {(2,200 – 500) + 1,000 (A/F,9%,10)}- 6,000 (A/P,9%,10)
= {1,700 +1,000(0.0627)}- 6,000(0.1627) = $786.5
Decision: Choose Alternative B to maximize EUAB-EUAC.

3. What is the equivalent uniform annual cost of two hydraulic systems with expected 30-year life with the following features? The first hydraulic system requires annual operating, maintenance and repair cost of $1,000 and it has a useful life of 15 years. Its initial cost is $35,000 and it has a salvage value of $6,000 at the end of its useful life. The second hydraulic system has an initial cost of $18,000 and is expected to be unserviceable after ten years. It requires $500 annual operating, maintenance and repair cost and has a zero salvage value after its 10-year useful life. Assume the interest rate is 7%. Present the economic equivalence function required, showing the functional notation and then the numerical value.

Solution:

i = 7%. System Service Life = 30 Years.
Component #1: Life = 15 Years.
OMR Cost = $1,000 per year.
Purchase Price = $35,000.
Salvage Value = $6,000.
EUAC = {35,000 (A/P, 7%, 15)} + 1,000 - {6,000 (A/F, 7%, 15)}
= 3,843 + 1,000 - 238.80 = $4,604.20.
Component #2: Life = 10 Years. OMR Cost = $500 per year.
Purchase Price = $18,000.
Salvage Value = $0.
EUAC = {18,000 (A/P, 7%, 10)} + 500 = 2,563.20 + 500 = $3,063.20.
Component #2 has lowest equivalent uniform annual cost and should be chosen.