Solution for Assignment 4

1. Which of the following has no effect on replacement decision?
   a. Defender's sunk cost
   b. Defender's salvage value
   c. Defender's operating cost
   d. Challenger's first cost

2. A sunk cost is the difference between
   a. First cost and salvage value
   b. Present market value and salvage value
   c. First cost and present market value
   d. Book value and present market value

3. When asset's annual operating and maintenance are always increasing while salvage values remain constant (over the life of asset), the economic life of the asset is
   a. Shortest possible life
   b. Longest possible life
   c. Zero
   d. Can't be said

4. The unused capital cost of an investment alternative at some point in time prior to the end of its expected life is known as
   a. Salvage value
   b. Implied salvage value
   c. Book value
   d. Depreciation charges

5. After two years of service rendered, the capacity of a bulldozer to move soil has reduced. If the bulldozer is considered for replacement, the reason will be
   a. Physical deterioration
   b. Obsolescence
   c. Lack of technological upgradation
   d. None of the above

6. The value of the defender in study of replacement is
   a. What it cost when originally purchased
   b. The sunk cost
   c. The salvage value at the end of its life
   d. Its worth at present time

7. A machine with 6 years of life was purchased two years ago for Rs. 10,000. Its annual maintenance cost is Rs. 750 and salvage value at the end of its life is Rs. 1,000. Now, a company is offering a new machine at a cost of Rs. 10,000. Its life is four years and its salvage value at the end of its life is Rs. 4,000. The annual maintenance cost of the new machine is Rs. 500. The company which is supplying the new machine is willing to take the old machine for Rs. 8,000 if it is replaced by the new machine. Assuming interest rate of 12%, compounded annually, the replacement analysis suggest that
   a. It is better to replace existing machine
   b. It is better to retain the existing machine
   c. It can't be decided
   d. None of the above

Solution:
Defender: P = 8000, F = 1000, n = 4, MC = 750, i = 12%
CR(i) = (8000 – 1000) (A/P,12,4) + (1000x0.2) + 750 = 3174
Challenger: P = 10000, F = 4000, n = 4, MC = 500, i = 12%
CR(i) = (10000 – 4000) (A/P,12,4) + (4000x0.2) + 500 = 2955
Since, CR(i) of challenger is lower than defender hence, existing machine should be replaced.

8. A machine is purchased at a cost of Rs 3,00,000. Following table shows expected salvage value and annual operating cost for each year of service.

End of Year	1	2	3	4
Salvage value (Lakhs)	1.5	1	0.5	0
Operating cost (Lakhs)	1	1.7	2.4	3.1

The economic service life for 12% interest rate is
   a. 1 Year
   b. 2 Year
   c. 3 Year
   d. 4 Year
   Solution: End of year 1: Given, P = 300000, F = 150000, i = 12%, n = 1, OC = 100000
   CR(i) = (300000 – 150000) (A/P,12,1) + (150000x0.12) + 100000 = 286000
   End of year 2: Given, P = 300000, F = 100000, i = 12%, n = 2, OC = 100000 + 70000(A/G,12,2)
   $$= 133019$$
   CR(i) = (300000 – 100000) (A/P,12,2) + (100000x0.12) + 133019 = 263359
   End of year 3: Given, P = 300000, F = 50000, i = 12%, n = 3, OC = 100000 + 70000(A/G,12,3)
   $$= 164722$$
   CR(i) = (300000 – 50000) (A/P,12,3) + (50000x0.12) + 164722 = 274797
   Since, minimum CR(i) is at the end of 2 year hence, economic service life is 2 year.

9. A 3-year-old backup power system is being considered for early replacement. Its current market value is Rs. 2,00,000. Estimated salvage values and annual operating costs for the next 5 years are given in table below. The economic service life of the system using interest rate of 10% per year will be

Year	Salvage Value (Rs.)	Annual Operating Cost (Rs.)
1	1,00,000	50,000
2	80,000	65,000
3	60,000	80,000
4	20,000	95,000
5	0	1,25,000

   a. 2 Years
   b. 3 Years
   c. 4 Years
   d. 5 Years
   Solution: End of year 1: Given, P = 200000, F = 100000, i = 10%, n = 1, OC = 50000
   CR(i) = (200000 – 100000) (A/P,10,1) + (100000x0.10) + 50000 = 170000
   End of year 2: Given, P = 200000, F = 80000, i = 10%, n = 2, OC = 50000 + 15000(A/G,10,2)
   CR(i) = (200000 – 80000) (A/P,10,2) + (80000x0.10) + 50000 + 15000(A/G,10,2) = 134287
   End of year 3: Given, P = 200000, F = 60000, i = 10%, n = 3, OC = 50000 + 15000(A/G,10,3)
   CR(i) = (200000 – 60000) (A/P,10,3) + (60000x0.10) + 50000 + 15000(A/G,10,3) = 126343
   End of year 4: Given, P = 200000, F = 20000, i = 10%, n = 4, OC = 50000 + 15000(A/G,10,4)
   CR(i) = (200000 –20000) (A/P,10,4) + (20000x0.10) + 50000 + 15000(A/G,10,4) = 129508
   End of year 5: Given, P = 200000, F = 0, i = 10%, n = 5, OC = 50000 + 15000(A/G,10,5) + 15000(A/F,10,5)
   CR(i) = (200000 –0) (A/P,10,5) + (0x0.10) + 50000 + 15000(A/G,10,5) + 15000(A/F,10,5)
   $$= 132372$$
   Since, minimum CR(i) is at the end of 3 year hence, economic service life is 3 year.

10. A machine was purchased two years ago at a cost of Rs. 2,00,000 to be useful for eight years with salvage value at the end of its life as Rs. 25,000. The annual maintenance cost is Rs. 25,000. The market value of the present machine is Rs. 1,20,000. Now, a new machine to cater to the need of the present machine is available at Rs. 1,50,000 to be useful for six years. Its annual maintenance cost is Rs. 14,000. The salvage value of the new machine at the end of its life is estimated to be Rs. 20,000. Using an interest rate of 12%, the decision regarding replacing the present machine with the new machine will be to

    a. Keep the existing machine
    b. Replace the existing machine with new machine
    c. It can't be decided
    d. None of the above

Solution:

Defender: $P = 120000$, $F = 25000$, $n = 6$, $MC = 25000$, $i = 12\%$

$CR(i) = (120000 - 25000)(A/P,12,6) + (25000 \times 0.2) + 25000 = 51104$

Challenger: $P = 150000$, $F = 20000$, $n = 6$, $MC = 14000$, $i = 12\%$

$CR(i) = (150000 - 20000)(A/P,12,6) + (20000 \times 0.2) + 14000 = 48016$

Since, $CR(i)$ of challenger is lower than defender hence, existing machine should be replaced.