Ex.1

What is the present worth of the following cash flows:

EOY	0	1	2	3	4	5	6	7	8
NCF(SR)	500	500	500	0	500	600	700	800	900
i(%)	12% Comp. Annually			11.39% Comp. Monthly			11.33% Comp. Continuously		

Solution

- **r=12 % Comp. Annually (0 to 2)**

  i= $\frac{r}{m} = \frac{12}{1} = 12\ \%$

- **r=11.39% Comp. Monthly (3 to 5)**

  ieff=$(1+\frac{r}{m})^m = (1-\frac{11.39}{12})^{12} = 12\%$

- **r= 11.33% Comp. Continuously (6 to 8)**

  $i_e = e^m - 1 = e^{0.1133} - 1 = 0.11997 \approx 0.12 = 12\%$

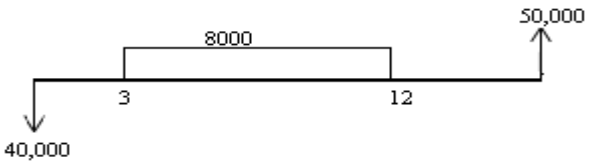
P_W=500+500(P/F12,1) +500(P/F12,2) +500(P/F12,4) +600(P/F12,5) +700(P/F12,6) +800(P/F12,7)+ 900(P/F12,8) = SR 3083.26

Ex.2

Ali invested a SR 40,000 in an investment fund. He receives SR 8000/year for 10 year starting in year 3. He receives nothing until year 16 at which he receives SR 50,000. Determine the future annual the 16-year period if MARR=12%.

Solution

- He receives SR 8000 starting in year 3 until 12 (10 years)



P_W= -40,000 +8000(P/A12,10)(P/F12,12) + 50,000(P/F12,16)
= SR 4190.39

A_W=4190.39(A/P 12,16)=SR 600.860

F_W= 4190.39(F/P12,16) = SR 25688.72

Ex.3

Three alternatives have the following net cash flow (NCF), salvage value (SV), operating and maintenance cost (O&M) **(in thousands)**

EOY	Alternative A			Alternative B			Alternative C		
	Rv	O&M	SV	Rv	O&M	SV	Rv	O&M	SV
0	-	-	70	-	-	100	-	-	40
1	80	50	50	90	40	90	60	40	30
2	80	50	30	90	40	80	60	40	20
3	80	50	20	90	40	70	60	40	10
4	80	60	15	90	40	60	60	40	5
5	80	60	10	90	40	50			
6	80	60	5	90	50	40			
7				90	50	30			
8				90	50	10			

The initial cost for alternatives A,B and C are :70,000 , 100,000 and 40,000 respectively .

1. Develop the net cash flow profiles for each alternative using :
   a. A planning horizon of 3 year.
   b. A planning horizon of 6 year.

2. If lest common multiple of lives used, **only specific planning horizon** to be used.

Solution

Part A

a.

EOY	A	B	C
0	-70K	-100K	-40K
1	30K	50K	20K
2	30K	50K	20K
3	30K+20K	50K+70K	20K+10K

b.

EOY	A	B	C
0	-70K	-100K	-40K
1	30K	50K	20K
2	30K	50K	20K
3	30K	50K	20K
4	20K	50K	20K+5K-40K=-15K
5	20K	50K	20K
6	20K+5K=25K	40K+40K=80K	20K+20K=40K

Part 2

L.C.M

n=8 16 24 32
n=6 12 18 24 30
n=4 8 12 16 20 24 28

Planning horizon is 24

Ex.4

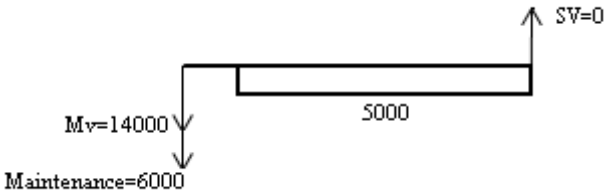
A Construction Company has an overhead crane that has a estimating life 7 year. The crane can be sold for 14,000. If the crane is kept in service it must be overhauled immediately at a cost of SR 6000. Operating and maintenance costs will be SR 5000/year after the crane is overhauled. After overhauling it crane will have zero salvage value at the end of 7 year period.
Anew crane will cost SR 36,000, will last for 7 year and will have 8000 salvage value at the time. Operating and maintenance costs are SR 25000 for new crane. The company used interest rate of 15% in evaluating investment alternatives. Should the company buy the new crane beads upon an annual cost analysis? **Use outsider viewpoint approach.**

Solution

Old	**New**
n=7	P_0=36000SR
Mv=14000 SR	n=7
Maintenance =Overhauled =6000 SR	SV=8000
O&M=5000/yr	O&M=2500/yr

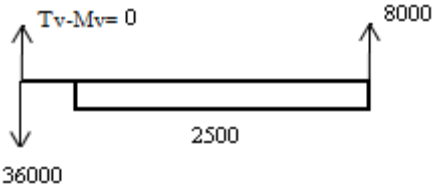
Outsider viewpoint

old



A_w= -2000(A/P15,7) -5000 = SR -9808

New



A_W= -36000(A/P15,7) +8000(A/F15,7)
= SR -10431

KEEP THE OLD ONE

Ex.5

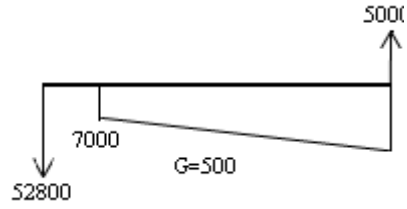
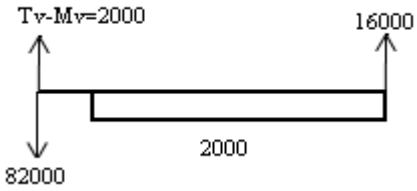
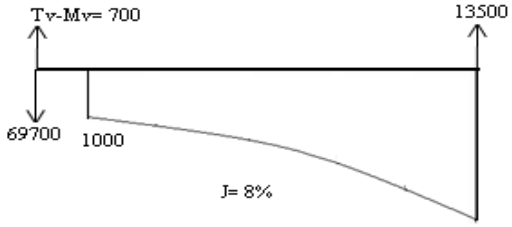
A company has a special machine that was purchased 3 years ago for SR 85,000. O&M costs for the last 3 year were SR 5500, SR 6000 and SR 6500 respectively. It is anticipated that this machine can be used for five more years and salvage value foe SR 5000 at the time. Annual O&M costs are expected to increase by the same rate of 500/yrs, with the first year cost anticipated to be SR 7000 currently this machine has a book value a market value of SR 52800

The company is considering replacing this machine with anther machine. Two alternatives have been identified. Machine A costs SR 82000, having a salvage value of SR 16000 after 5 years. A trade- in value of SR 54800 is offered from the dealer for the old machine. Annual O&M cost the next 5 years are expected to be SR 2000.

Machine B cost SR 69700 having a Salvage value of SR 13500 after 5 year. A treade in alue of SR 53500 is offered for the old machine .O&M costs for Alternative B is given $SR1000(1.08)^{n-1}$, where n= 1,2,3,4,5
For MARR of 10% using the present worth method and the outsider viewpoint determine the best economic Alternative to be selected.

Solution

Old	New A	New B
Mv=SR 52800 SV=SR 5000 O&M= increase 500/yrs n=5	P0=SR 82000 SV=SR 16000 O&M=SR 2000 n=5	P0=69700 SV=13500 O&M= $SR1000(1.08)^{n-1}$ where n= 1,2,3,4,5

Old	New A	New B
		
P_w= -52800 – 7000(P/A10,5) -500(P/G10,5)+5000(P/F10,5) = -SR79662	**P_W =80000 -2000(P/A10,5) +16000(P/F10,5) =-SR 77647**	**P_w=-69000 -1000(P/A i,j,n) + 13500(P/F 10,5) = -SR 65000.95**

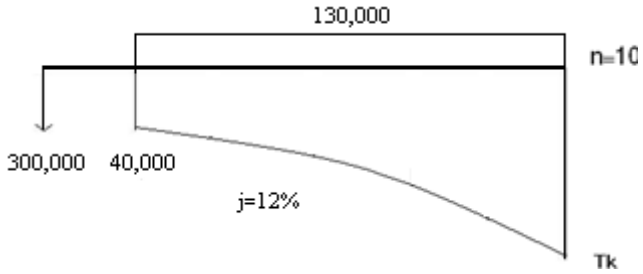
REPLACE WITH NEW B

Ex.6

A recreational facility has a first of SR 300,000. The operating and maintenance cost for the first year are expected to be SR 40,000. These costs will increase at 12% annually. Income foe=r this facility will be help fixed at SR 130,000. The facility will be operated for 10 year. The inflation will average 4.5% and inflation –free real return of 3.6 % desired.What is the present worth of this project using both **then-current** and **constant worth** analysis?

Solution

f= 4.5% , i_r = 3.6% , n= 10 years



$i_c = i_r + f + f i_r \longrightarrow i_c = 8.262\%$

- **Then-current**

Pw=-300,000 – 40,000[$\frac{1-(1+0.12)^{10} \quad (1+0.8262)^{-10}}{0.8262-0.12}$] + 130,000[$(1+0.8262)^{-1}$ +……...+$(1+0.8262)^{-10}$]

= SR 129404

- **constant worth**

$$C_k = T_k (1+f)^{-k}$$

C1=124.4, C2=119.04, C3=113.91, C4=109.01, C5=104.31, C6=99.826, C7=95.53, C8=91.4
C9=87.5, C10=83.7

$j_c = j_r + f + j_r (f) \longrightarrow j_r = 7.17\%$

$PW=-300{,}000 -380{,}000\left(\frac{1-(1+0.717)^{10}\ (1+0.036)^{-10}}{0.717-0.036}\right] + C1(1+0.036)^{-1}$
$+\ldots\ldots+C10(1+0.036)^{-10}$

= SR 129718

Ex.7

A company estimates that the total cost(TC) and unit selling price (SP) per month for a potential new product is given by :
$TC = 0.001\ t^2+3t+ 2$ SR/month
SP = 25 SR/units
t= units produced per month

a. Determine total revenue when total profit is maximum.
b. What is the maximum total profit per month.
c. What is the marginal cost at a production level of 5000 unit.
d. What the marginal profit at production level of 25000 unit.

Solution

a.

TR=25t
$TP=TR-TC=25t-(0.001\ t^2+3t+ 2)$

$\frac{\delta TP(t)}{\delta t} = 25 - 0.002t - 3 = 0 \longrightarrow t=11000$

$TR=25\times11000=275000$

b.

TP=TR-TC

$TP=TR-TC=25t-(0.001\ t^2+3t+ 2)$

$\frac{\delta TP(t)}{\delta t} = 25 - 0.002t - 3 = 0$

$TP=25\times11000-(0.001\times 11000^2+3\times11000+ 2)=SR\ 120998$

c.

$Mc=\frac{\delta TC(t)}{\delta t}= 0.002t +3$ at t= 5000

$Mc= 0.002\times5000 +3 = 13$

d.

$Mp=\frac{\delta TP(t)}{\delta t}= 25- 0.002t -3= 25-0.002\times25000-3=-28$

تمت بحمد الله