Benha University
Benha Higher Institute of Technology
Department of Mechanical Eng.
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Model Answer of the Final Exam

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نموذج الاجابة المادة :اقتصاد هندسى م ٥٦١ الغرقة الخامسة
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PROPLEM 1

After 2-years the future value of borrowed money will be F =P(F/P,r,n) = $P e^{rn}$= 45000x1.2712 =57,206

The continuous interest rate of one month = $e^{0.01}$-1=0.01005
= P (A/P,i,n) = P $\{[i(1+i)^n]/[(1+i)^n - 1]$ Capital Recovery A

A =57,206X$\{[0.01005(1.01005)^{60}]/[(1.01005)^{60} - 1]$=57,206(0.01005x1.8221/0.8221)=$1274.25

Problem 2

i) Total investment

P_A= $650000+91,810x(P/A,15,5)=$957,765.4

P_B= $780000+53,569x(P/A,15,5)=$959,574

P_C= $600000+105000x(P/A,15,5)=$951,981

P_D= $720000+74000x(P/A,15,5)=$968,062.8

Chose C as minimum cost.

ii)Use incremental analysis

Construct the table in ascending way

Without inflation

	YEAR	C	A	D	B	A-C	D-C	B-C	
Initial Cost	0	$600000	$650000	$720000	$78000	-$50000	$-12000	$-180,000	
O&M	1	$105,000	$91,810	$74,000	$53,569	$13,190	$31,000	$51,431	
O&M	2	$105,000	$91,810	$74,000	$53,569	$13,190	$31,000	$51,431	
O&M	3	$105,000	$91,810	$74,000	$53,569	$13,190	$31,000	$51,431	
O&M	4	$105,000	$91,810	$74,000	$53,569	$13,190	$31,000	$51,431	
O&M	5	$105,000	$91,810	$74,000	$53,569	$13,190	$31,000	$51,431	

$NPW_{(A-C)}$ = $ -50000+$13190*(P/A,15%,5)= $ -50000+$13190*3.3522= $-5784.482
Choose C
NPW_{D-C} =$-120,000 +31,000*3.3522 = $-16081.8
Choose C

NPW_{B-C} = -$180,000 + $51,431*3.3522 = --$7593
Choose C

When Inflation is considered

Real interest rate i ’= (i-f)/(1+f)= 5.5%

Use the formula to find P/A
(P/A,5.5,5) = 4.270284475619104957290192861196

ii) Total investment

P_A= $650000+91,810x(P/A,5.5%,5)=$١٠٤٢٠٥٤.٨
P_B= $780000+53,569x(P/A,5.5%,5)=$١٠٠٨٧٥٤. 8
P_C= $600000+105000x(P/A,5.5%,5)=$١٠٤٨٣٧٩.٨
P_D= $720000+74000x(P/A,5.5%,5)=$.١٠٣٦٠٠١

Considering Inflation Choice B is the best.

3) The total Marginal cost

Year	Market value	Loss in Market value	Foregone interest	Operating Cost,$	Maintenance Cost,$	Salvage Value, $	Total Recovery Cost
0	$60000						
1	35.000	-$25000	-$6000	--15,000	-3000	35.000	-$49000
2	30.000	-$5000	-$3500	-17,000	-3000	30.000	-$28500
3	25.0000	-$5000	-$3000	-19,000	-3000	25.0000	--$30000
4	20,000	-$5000	-$2500	-21,000	-3000	20,000	-$31500
5	15,000	-$5000	-$2000	-23,000	-3000	15,000	--$33000

The life cost of one year is 49000
The EUAC for two years is = (49000+28500/(1+i))*(A/P,10%,2)= (49000+28500/(1+i))*5762= (49000 +25909)*0.5762=-$43162.6
The EUAC for three years is = (49000+28500/(1+i)+30000*$(1+i)^{-2}$)* A/P,10%,3)= (49000 +25909+٢٤٧٩٣.٣)*0.4021=-$40090.3
The EUAC for four years is = (49000+28500/(1+i)+30000*$(1+i)^{-2}$)*+31500*$(1+i)^{-3}$)(A/P,10%,4)= (49000 +25909+٢٤٧٩٣.٣ +23666.3)*0.3155=-$38922
The EUAC for five years is = (49000+28500/(1+i)+30000*$(1+i)^{-2}$)*+31500*$(1+i)^{-3}$+33000*$(1+i)^{-4}$)(A/P,10%,5)= (49000 +25909+٢٤٧٩٣.٣ +23666.3+22539.4)*0.2638=-$38409
Economic life is 5 years

Year	Market value	EUAC of Capital recovery	Foregone interest	Operating Cost,$	Maintenance Cost,$	Salvage Value, $	Total Recovery Cost
0	$60000						
1	35.000	-$25000	-$6000	--15,000	-3000	35.000	-$49000
2	30.000	-$5000	-$3500	-17,000	-3000	30.000	-$28500
3	25.0000	-$5000	-$3000	-19,000	-3000	25.0000	--$30000
4	20,000	-$5000	-$2500	-21,000	-3000	20,000	-$31500
5	15,000	-$5000	-$2000	-23,000	-3000	15,000	--$33000

For one year
EUAC of Capital recovery for one year = -$60000*(A/P,10%,1) +$ 35000*(A/F,10%,1)
=-$ 66000+$ 35000 =-$31000
EUAC of Capital recovery for two years =-$ 60000*(A/P,10%,2) + $ 30000*(A/F,10%,2)

=-$ 60000*0.5762 +$ 30000* 0.476 =-$ 20292
EUAC of Capital recovery for three years = -$60000*(A/P,10%,3) +$ 25000*(A/F,10%,3)

=-$ 60000*0.4021 +$25000* 0.3021=-$16573.5
EUAC of Capital recovery for four years =-$ 60000*(A/P,10%,4) +$ 20000*(A/F,10%,4)
=-$ 60000*0.3155 +$20000* 0.2155=-$14620

EUAC of Capital recovery for five years =-$ 60000*(A/P,10%,5) +$ 15000*(A/F,10%,5)

=-$ 60000*0..2638 +$15000* 0.1638 =-$13371

Year	Market value	EUAC of Capital recovery	Operating Cost,$	Maintenance Cost,$	Total EUAC
0	$60000				
1	35.000	-$31000	--15,000	-3000	-$49000
2	30.000	-$20292	-17,000	-3000	-$40292
3	25.0000	-$16573.5	-19,000	-3000	--$38573
4	20,000	-$14620	-21,000	-3000	-$38620
5	15,000	-$13371	-23,000	-3000	--$39391

Year	Market value	EUAC of Capital recovery	EUAC OP cost,$	Maintenance Cost,$	Total EUAC
0	$60000				
1	35.000	-$31000	--15,000	-3000	-$49000
2	30.000	-$20292	-15,932.4	-3000	-$39224.4
3	25.0000	-$16573.5	-16873.2	-3000	--$36446.7
4	20,000	-$14620	-17636	-3000	-$35256
5	15,000	-$13371	-18620	-3000	--$34991

Economic life is 5 years

4)

Estimated salvage value = **$750**. Giuliano's is in the **34%** tax bracket.

SL depreciation = (3000-750)/5 = $450 per year.

Year	CF before taxes	SL Depr.	Taxable Inc.	Tax (34%)	CF after taxes
	(a)	(b)	(c) = (a) – (b)	(d) = -34%(c)	(a) + (d)
0	-$3,000				-$3,000
1	800	450	350	-119	681
2	800	450	350	-119	681
3	800	450	350	-119	681
4	800	450	350	-119	681
5	800 + 750	450	350	-119	681 + 750

Before Taxes: CFS (a) has IRR = 15.69%
After Taxes: CFS (e) has IRR = 10.55%

After-tax analysis is what is most important.
Income taxes are a major disbursement that cannot be ignored.
Only the after-tax ROR is a meaningful value.

5)

Using the geometric gradient with real factor = (1+i)/(1+f)

$$= A\,(P/A,g,i,n) \quad = A\,\{[1-(1+g)^{n}(1+i)^{-n}]/(i-g)\} \qquad P \qquad \text{If } i \neq g,$$

P = 1800*٩.٩١٣٢- = -17843.8 = 1800*1.12=$ 19450

iii) Constant dollar

i' = (i-f)/(1+f) = 2.٧٥٢٢٩%

$$= A\,(P/A,i,n) \qquad = A\{[(1+i)^{n}-1]/[i(1+i)^{n}]\} \quad \text{Present Worth:P}$$

P = 1800 *(٠.٤٢٣٢٧)/(0.0275229*1.42327)=1800*١٠.٨٠٥٤ =19450