FACULTY OF BUSINESS ADMINISTRATION

SUBJECT TITLE: ENGINEERING ECONOMICS AND MARKETING MANAGEMENT

TIME VALUE OF MONEY :

Money today is worth more than money tomorrow. This is the first rule of finance. Is implies that every business decision should involve the time value of money. Money in different time cannot be added or subtracted.

(ROI)rate of interest is used to express time value of money. We already understand that in real markets. It is generally the compound interest that is calculated on received or paid amount. Discounting means to reduce the future sum to its present value; compounding means to increase the present value to its future value.

EQUIVALENCE: Equivalence by which is meant that the fact that many different time series or method of paying back capital and interest are equivalent .

COMPOUND INTEREST:

It is any interest earned by the original capital is added to and becomes part of the capital at the end of the interest period so, that in succeeding intervals of each interest period interest is earned on all previous interest payment s as well as on the original capital.

The purpose of most calculations is engineering economics is becoming minimum cost incurred to obtain to return on invested capital by either

Studying the capital required to do the given job
Studying the cost of operations including recovering of the capital in a depreciating investment.
FORMULAS AND EQUATIONS

EQUATIONS FOR ECONOMICS STUDIES :

The equations shown constitute the most generally used in theoretical engineering economy studies and a brief description regarding their use follows :

Equation (2-1): $S=p(1+i)^n = pc_f$ gives the amount of money S at a future date that is required to pay of one lump sum a given amount of money P borrowed the present time with interest compounded 'n' time worth. The amount P is sometimes called the discounted value of S. Equation (2-1) will be recognized as sum series as illustrated in table (2-2)

EQUATION (2-2)

$$R = P\,\frac{[i(1+i)^n]}{(1+i)^{n-1}} = \frac{p}{p_f}$$

Gives the amount R each uniform payment n interest periods that will be required to pay off

a of given amount of money P borrowed at the present time.

EQUATIONS (2-12) $(1+i/m)^{mn} = e^{2n}$

i = interest rate preperiod , n in number

p = present sum of money

S = sum at future date at 'n' period

n interest periods that will be required to pay off a given amount of Money P borrowed at the present time.

Equation (2-3) $S = R\dfrac{(1+i)^n - 1}{i}$ Future worth at end of n period.

Equation (2-4) $P = R\dfrac{(1+i)^n - 1}{i(1+i)^n} = RP_F$ Present Worth

Equation (2-5) $R = (P-L)\dfrac{i(1+i)^n}{(1+i)^n - 1} + Li$ Uniform payment With Salvage.

Equation (2-6) $(1+i)^n = \dfrac{1}{1-(P/R)i}$ Rate of return, or payment When L is zero or Salvage is neglected.

Equation (2-7) $n = \dfrac{-\log(1 - iP/R)}{\log(1+i)}$ payment time When L is zero or salvage neglected.

Equation (2-8) $P' = R'/i'$ Capitalized Cost.

Equation (2-9) $R'' = P\dfrac{i}{(1+i')^n - 1}$ Sinking-fund dep… i' is Sinking fu… interest rate, and L… zero

Equation (2-10) $R = R'' + Pi'$ A form of Eq. (2…

Equation (2-11) $P = \dfrac{R''(1+i')^n - 1}{i[(1+i')^n - 1] + i'}$ Hoskold's form… i is rate of ret… i' is Sinking…

R =end of period payment to give P in uniform series .

L= salvage at some future date

m = no of times interest is compounded per year , where i is the nominal annual rate

cf = compound interest factor equal to $(1+i)^n$

P_f = present worth factor equal to $(1+i)^{n-1} / i(1+i)^n = P/R$

PROBLEMS :

1. n = 10

p = 1000

i = 6%   if L is not given then L IS 0

SOLUTION

$S = p(1+i)^n$

$= 1000(1+6/100)^{10} = 1000(106/1001)^{10} = 1000(1.06)^{10}$

S = 1791

$R = p[i(1+i)^n]/(1+i)^n-1$

$=1000[6/100(1+6/100]^{10}/(1+6/100)^{10}-1$

= Rs 135.90

$S = R(1+i)^n-1/i$

$=135.90\ (1+6/100)^{10}-1/6/100$

S= 1791

$P= R(1+i)^n-1/i(1+i)^n$

$= 135.90\ (1+6/100)^{10}-1/6/100(1+6/100)^{10}$

2. A pump installation costing Rs. 3000 with a life of 3 years and having no salvage value requires Rs .200 a year for maintenance and operation. What is the present work of the service ended by the work. What the future worth of 3years service ended by the pump . what is capitalised cost for this service assuming perpetual operation?

Solution : Rs . 3000

$n = 3$ years

salvage value $R = Rs\ 200$

$P = R(1+i)^n-1/ i\ (1+i)^n$

$= 200\ (1+0.08)^3-1/ 0.08\ (1+0.08)^3$

$P = 515$

Add = +300

3515

P for the 1 year expenditure = $200*1/(1+i)^1 = 200*1/(0.01) = 185$

P for the 2 year expenditure = $200*1/(1+i)^1 = 200*1/(0.02)^2= 171$

P for the 3year expenditure =$200*1/(1+i)^1 = 200*1/(0.03)^3=159$

17050 this relates the prepectual uniform payments R to an equivalent capital cost R at the present time for a given interest rate .

3. what interest rate is earned by an investment of RS1,00,000 for a distillation column which will reduce cost by rs 16800. The column will have a estimated life of 8 years and a salvage value of rs 8000

Solution : p= rs 1,00,000

R = rs 16800

L = 8000

n= 8 years

using eq (2.5) $R = (P-L)i(1+i)^n / (1+i)^n -1 +Li$

assume = 8.5

16800 → (100000-8000)8.5/100(1+8.5/100)8 / (1+8.5/100)8-1

= 8.5 (approximately)

4. if money is considered to be worth 10%. How many years will be required for an automatic packing machine costing rs 12000. With no salvage value to pay for itself . if it saved rs 2400 a year in labour cost when used for packing cement for shipment

Solution :

n=?

Using (2.7)n = -log (1-i)(P/R)/ log (1+i)

P = rs 12000

R = rs 2400

i = 10%

⟶ n = -log[1-10/ 100(12000/2400)]/ log (1+10/100)

= 7.2 years