Annuties

Q.1. Mr. Aggarwal buys a house at Rs.30,00,000 for which he agrees to make equal payments at the end of each year for 10 years. If money is worth 10% p.a., find the amount of each instalment. [Take $(1.1)^{-10} = 0.3855$]

Solution : 1

We have , V = Rs.30,00,000 , r = 10% p. a. , n = 10 years. A = ?

Using , $V = A/r[1 - (1 + r)^{-n}]$

Therefore , $30,00,000 = A/(10/100)[1 - \{1 + (10/100)^{-10}\}]$

$= A/(.1)[1 - (1.1)^{-10}]$

Or, 3,00,000 = A [1 – 0.3855] [As, $(1.1)^{-10} = 0.3855$]

Therefore , A = 3,00,000/0.6145 = 488201.79.

Hence , the amount of each instalment = Rs.488201.79 .

Q.2. A person borrowed a sum of money and paid it back in three equal annual instalments of Rs.2,160 each. If the rate of interest charged is 20% p.a. compounded annually, calculate :

i. The sum borrowed.
ii. The total interest charged.

Solution : 2

We have , A = Rs.2,160 , n = 3, r = 20%, V = ?

Using, $V = A/r[1 - (1 + r)^{-n}]$

$= 2160/0.2[1 - (1.2)^{-3}]$

$= 10800[1 - 1000/(12)^3]$

$= 10800[(1728 - 1000)/1728]$

$= (10800 \times 728)/1728$

= 4550.

i. Sum borrowed = Rs.4550.00

ii. Total interest = 2160 × 3 – 4550.00 = Rs.1930.

Q.3. The price of a tap recorder is Rs.1,561. A person purchase it by paying Rs.300 in cash and the balance is to be paid with due interest in 3 half yearly equal instalments. If the dealer charges interest at the rate of 10% per annum compounded halfyearly, find the value of each instalment.

Solution : 3

Half yearly rate = r = 10/2 = 5%

No. of instalments = n = 3

Price of tap recorder = V = Rs.1261

Let each instalment be A ,

Using formula , $V = A/r[1 – (1 + r)^{-n}]$, we get

$1261 = A/0.05[1 – (1.05)–3]$

Or, $1261×0.05 = A[1 – 0.863837598]$

Or, $63.05 = A(0.1361624)$

Or, A = 63.05/0.1361624 = Rs.463.05 (Approx.)

Q.4. Find the amount of an ordinary annuity if payment of Rs.600.00 is made at the end of every quarter for 10 years at the rate of 4% per year compounded quarterly?

Solution : 4

We have i = 4% = (4/100) × (1/4) = 0.01, a = 600 , n = 40.

Using , $A = a/i[(1 +i)^n –1] = (600/0.01)[(1 + 0.01)^{40} – 1]$

$= 60000[(1.01)^{40} – 1]$

$= 60000[1.48886 – 1]$

= 60000 [0.48886] = 29331.6

= Rs.29331.60

Q.5. How much should a company set aside at the end of each year if it has to buy a machine expected to cost Rs.1,00,000 at the end of 4 years and the rate of interest is 5% per annum compounded annually ?

Solution : 5

We have a = instlement = ? , A = 1,00,000 , i = 5% = 5/100 = 0.05, n = 4 .

Using , $A = (a/i)[(1+i)^n - 1]$, we get

$1,00,000 = (a/0.05)[(1 + 0.05)^4 - 1]$

Or, $1,00,000 \times 0.05 = a[(1.05)^4 - 1]$

Or, $5,000 = a[1.21551 - 1] = a \times 0.21551$

Or, a = 5,000/0.21551= Rs.23,201.18 .

Q.6. An iPod is purchased on instalment basis, such that Rs. 8,000 is to be paid on the signing of the contract and four yearly instalments of Rs. 3,000 each, payable at the end of the first, second, third and fourth years. If compound interest is charged at 5% per annum, what would be the cash price of the iPod? [Take $(1.05)^{-4} = 0.8227$]

Solution : 6

Present worth $= A/r[1 - (1 + r)^{-n}]$

$= (3000/0.05)[1 - (1.05)^{-4}]$

$= (300000/5)(1 - .8227)$

$= 300000/5(0.1773)$

= Rs. 10,638.

Therefore, cash price = Rs. 8000 + Rs. 10638

= Rs. 18638.

Q.7. A propeller costs Rs. 1,80,000 and its effective life is estimated to be 10 years. A sinking fund is created for replacing the propeller by a new model at the end of its life time, when its scrap realized a sum of Rs. 34,000 only. The price of the new model is estimated to be 30% more than the price of the present one. What amount should be put into the sinking fund at the end of each year, if it accumulates at 4% per annum compound interest? [Take $(1.04)^{10} = 1.480$].

Solution : 7

$M = A/r[(1 + r)n - 1]$

$180000 + (30/100) \times 180000 - 34000 = A/0.04[(1 + 0.04)^{10} - 1]$

$180000 + 54000 - 34000 = A/0.04[1.480 - 1]$

$200000 = A/0.040 \times 0.480$

$= 12 A$

-> $A = 200000/12$

-> = Rs. 16666.6