SOLUTION

(a) Principal = P = 5000, Rate = r = 5% Compounded annually
Time = n = 10 years

$$\text{Amount} = P\left(1+\frac{r}{100}\right)^n = 5000\left(1+\frac{5}{100}\right)^{10}$$

$$= 5000\left(\frac{105}{100}\right)^{10} = 5000(1.05)^{10}$$

$$= 5000(1.628894627) = \text{Rs. } 8144.47$$

Hence Amount = Rs. 8144.47 and Interest = Rs. 3144.47

(b) Principal = P = 5000, Rate = r = 5% Compounded annually
Time = n = 20 six months periods semi-annually

$$\text{Amount} = P\left(1+\frac{r}{100}\right)^n$$

$$= 5000\left(1+\frac{25}{100}\right)^{20} = 5000\,(1+0.025)^{20}$$

$$= 5000\,(1.163861644) = \text{Rs. } 8193.08$$

Hence Amount = Rs. 8193.08 and Interest = Rs. 3193.08

(c) Principal = P = 5000, Rate = r = 5% per annum
Five percent compounded quarterly = $^{0.05}/_4 = 0.0125$ per quarter.
Since there are four quarters in a year, the number of interest periods is n = 40 quarters. Hence the compound amount is:

$$\text{Amount} = P\left(1+\frac{r}{100}\right)^n = 5000\left(1+\frac{1.25}{100}\right)^{40}$$

$$= 5000\,(1+0.0125)^{40} = 5000\,(1.0125)^{40}$$

$$= 5000(1.643619463) = \text{Rs. } 8218.10$$

Hence Amount = Rs. 8218.10 and Interest = Rs. 3218.10

(d) Principal = P = 8000, Rate = r = 8% per annum
Time = n = 10 years

$$\text{Amount} = P\left(1+\frac{r}{100}\right)^n$$

EXERCISE NO. 4

-:4.1:-

Rs. 500 a year for ten years at 4% compounded annually.

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 500, i = 4% and n = 10

$$S = 500\left[\frac{(1+0.04)^{10} - 1}{0.04}\right]$$

$$= 500\left[\frac{1.48024428 - 1}{0.04}\right] = 500\left[\frac{0.48024428}{0.04}\right]$$

$$= 500(12.006107) = \text{Rs. } 6003.05$$

-:4.2:-

Rs. 800 a quarter for 5 years at 4% compounded quarterly.

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 800, $i = {}^{4\%}/_{4} = 1\%$ and n = 20 periods

$$S = 800\left[\frac{(1+0.01)^{20} - 1}{0.01}\right]$$

$$= 800\left[\frac{(1.01)^{20} - 1}{0.01}\right] = 800\left[\frac{1.22019004 - 1}{0.01}\right]$$

$$= 800\left[\frac{0.22019004}{0.01}\right] = 800(22.019004)$$

$$= \text{Rs. } 17615.20$$

-:4.3:-

Rs. 100 a month for 5 years at 6% compounded monthly.

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 100, $i = {}^{6\%}/_{12} = {}^{1\%}/_{2} = 0.005$ per periods and n = 60

$$S = 100\left[\frac{(1+0.005)^{60} - 1}{0.005}\right]$$

$$= 100\left[\frac{(1.005)^{60} - 1}{0.005}\right] = 100\left[\frac{1.34885015 - 1}{0.005}\right]$$

$$= 100\left[\frac{0.34885015}{0.005}\right] = 100(69.77003) = \text{Rs. } 6977.00$$

-:4.4:-

A man invest Rs. 300 at the end of each month in a fund which pays 4% compounded semiannually. How much does he have just after the tenth deposit.

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 300, $i = {}^{4\%}/_{2} = 2\%$ per periods and n = 10

$$S = 300\left[\frac{(1+0.02)^{10} - 1}{0.02}\right]$$

$$= 300\left[\frac{(1.02)^{10} - 1}{0.02}\right] = 300\left[\frac{1.21899442 - 1}{0.02}\right]$$

$$= 300\left[\frac{0.21899442}{0.02}\right] = 300(10.949721)$$

$$= \text{Rs. } 3284.92$$

-:4.5:-

Find the amount of Rs. 250 invested at the end of each of 5 successive years at 6% interest compounded annually.

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 250, i = 6% and n = 5

$$S = 250\left[\frac{(1+0.06)^5 - 1}{0.06}\right]$$

$$= 250\left[\frac{(1.06)^5 - 1}{0.06}\right] = 250\left[\frac{1.3382258 - 1}{0.06}\right]$$

$$S = 250\left[\frac{0.3382258}{0.06}\right] = 250(5.637096667) = \text{Rs. } 1409.27$$

-:4.6:-

Miss Nasima saved Rs. 540 per year which she deposited in a saving bank at the end of each year. If the bank paid 2% interest compounded annually on all deposits, what was the amount on deposit at the end of 11 years?

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 540, i = 2% and n = 11

$$S = 540\left[\frac{(1+0.02)^{11} - 1}{0.02}\right]$$

$$= 540\left[\frac{(1.02)^{11} - 1}{0.02}\right] = 540\left[\frac{1.24337431 - 1}{0.02}\right]$$

$$= 540\left[\frac{0.24337431}{0.02}\right] = 540(12.1687155) = \text{Rs. } 6571.11$$

-:4.7:-

Mr. Khalid wishes to save money to take a trip. If he deposits Rs. 150 at the end of each month for 24 months in an investment that pays 12% compounded monthly, how much will he have on deposit.

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 150, $i = {}^{12\%}/_{12} = 1\%$ per periods and n = 24

$$S = 150\left[\frac{(1+0.01)^{24} - 1}{0.01}\right]$$

$$= 150\left[\frac{(1.01)^{24} - 1}{0.01}\right] = 150\left[\frac{1.26973465 - 1}{0.01}\right]$$

$$= 150\left[\frac{0.26973465}{0.01}\right] = 150(26.973465) = \text{Rs. } 4046.02$$

-:4.8:-

Find the amount of an ordinary annuity of Rs. 4400 per quarter for 5 years at the rate of 16% per annum compounded quarterly.

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 4400, $i = {}^{16\%}/_{4} = 4\%$ per periods and n = 20

$$S = 4400\left[\frac{(1+0.04)^{20} - 1}{0.04}\right]$$

$$= 4400\left[\frac{(1.04)^{20} - 1}{0.04}\right] = 4400\left[\frac{2.19112314 - 1}{0.04}\right]$$

$$= 4400\left[\frac{1.19112314}{0.04}\right] = 4400(29.7780785)$$

$$= \text{Rs. } 131023.55$$

-:4.9:-

Mrs. Khurshid deposit Rs. 5555 at the end of each six months for 4 years and 6 months at 10% compounded semiannually. Find the amount of the investment.

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 5555, i = $^{10\%}/_{2}$ = 5% per periods and n = 9

$$S = 5555\left[\frac{(1+0.05)^9 - 1}{0.05}\right]$$

$$= 5555\left[\frac{(1.05)^9 - 1}{0.05}\right] = 5555\left[\frac{1.55132822 - 1}{0.05}\right]$$

$$= 5555\left[\frac{0.55132822}{0.05}\right] = 5555(11.0265644) = \text{Rs. } 61252.565$$

-:4.10:-

Find the accumulated value of Rs. 5000 invested at the end of each quarter year for 5 years at 8% compounded quarterly.

SOLUTION

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Here R = Rs. 5000, i = 2% and n = 20 quarters

$$S = 5000\left[\frac{(1+0.02)^{20} - 1}{0.02}\right]$$

$$= 5000\left[\frac{(1.05)^{20} - 1}{0.02}\right] = 5000\left[\frac{1.485947396 - 1}{0.02}\right]$$

$$= 5000\left[\frac{0.485947396}{0.02}\right] = 5000(24.2973698) = \text{Rs. } 121486.85$$

-:4.11:-

A man sets a side Rs. 200 at the beginning of each year towards a fund for his son's college education. If the money is invested at 4% per year, how much will he accumulated at the end of 10 years?

SOLUTION

$$S = R\left[\frac{(1+i)^{n+1}-1}{i}\right] - R$$

Here R = Rs. 200, i = 4% and n = 10

$$S = 200\left[\frac{(1+0.04)^{10+1}-1}{0.04}\right] - 200$$

$$= 200\left[\frac{(1+0.04)^{10+1}-1}{0.04}\right] - 200$$

$$= 200\left[\frac{(1.04)^{11}-1}{0.04}\right] - 200 \Rightarrow 200\left[\frac{1.53945406-1}{0.04}\right] - 200$$

$$= 200\left[\frac{0.53945406}{0.04}\right] - 200 = 200(13.4863515) - 200$$

= Rs. 2697.27 – Rs. 200 = Rs. 2497.27

-:4.12:-

If a payment of Rs. 500 is made today and a like payment each year for 5 years, how much will be on deposit at the end of 4 years, if the interest rate is 5% compounded annually?

SOLUTION

$$S = R\left[\frac{(1+i)^{n+1}-1}{i}\right] - R$$

Here R = Rs. 500, i = 5% and n = 5

$$S = 500\left[\frac{(1+0.05)^{5+1}-1}{0.05}\right] - 500$$

$$S = 500\left[\frac{(1.05)^{6}-1}{0.05}\right] - 500 = 500\left[\frac{1.34009564-1}{0.05}\right] - 500$$

$$= 500\left[\frac{0.34009564}{0.05}\right] - 500 \Rightarrow 500(6.8109128) - 500$$

= Rs. 3400.96 – Rs. 500 = Rs. 2900.96

-:4.13:-

How much money would be accumulated at the end of 23 years by a man if he invested Rs. 325 on the first day of each year at 4% interest compounded annually?

SOLUTION

$$S = R\left[\frac{(1+i)^{n+1}-1}{i}\right]-R$$

Here R = Rs. 325, i = 4% and n = 23

$$S = 325\left[\frac{(1+0.04)^{23+1}-1}{0.04}\right]-325 \Rightarrow 325\left[\frac{(1.04)^{24}-1}{0.04}\right]-325$$

$$= 325\left[\frac{2.56330416-1}{0.04}\right]-325 \Rightarrow 325\left[\frac{1.56330416}{0.04}\right]-325$$

$$= 325(39.082604) - 325 = \text{Rs. } 12701.85 - \text{Rs. } 325 = \text{Rs. } 12376.85$$

-:4.14:-

On his fifty first birthday and each third month thereafter, Dr. Habib Ullah invested Rs. 475 at 4% interest compounded quarterly. At the end of his fifty seven year, what was the amount on deposit?

SOLUTION

$$S = R\left[\frac{(1+i)^{n+1}-1}{i}\right]-R$$

Here R = Rs. 475, i = $^{4\%}/_{4}$=1% per period and n = 24

$$S = 475\left[\frac{(1+0.01)^{24+1}-1}{0.01}\right]-475$$

$$= 475\left[\frac{(1.01)^{25}-1}{0.01}\right]-475 = 475\left[\frac{1.28243200-1}{0.01}\right]-475$$

$$= 475\left[\frac{0.28243200}{0.01}\right]-475 = 475(28.2432) - 475$$

$$S = \text{Rs. } 13415.52 - \text{Rs. } 475 = \text{Rs. } 12940.52$$

-:4.15:-

Mr. Aslam bought a SONY T.V. by paying Rs. 350 each month for 12 months, beginning from now. If money is worth 12% compounded monthly, what was the selling price of the T.V. on each payment?

SOLUTION

$$S = R\left[\frac{(1+i)^{n+1}-1}{i}\right]-R$$

Here R = Rs. 350, $i = {}^{12\%}/_{12} = 1\%$ per period and n = 12

$$S = 350\left[\frac{(1+0.01)^{12+1}-1}{0.01}\right]-350 \Rightarrow 350\left[\frac{(1.01)^{13}-1}{0.01}\right]-350$$

$$= 350\left[\frac{1.13809328-1}{0.01}\right]-350 \Rightarrow 350\left[\frac{0.13809328}{0.01}\right]-350$$

$$= 350(13.809328)-350 = \text{Rs. } 4833.26 - \text{Rs. } 350 = \text{Rs. } 4483.26$$

-:4.16:-

Find the amount of an annuity due of Rs. 200 paid at the beginning of each 6 month period for 8 years if the interest rate is 6% compounded semiannually.

SOLUTION

$$S = R\left[\frac{(1+i)^{n+1}-1}{i}\right]-R$$

Here R = Rs. 200, $i = {}^{6\%}/_{2} = 3\%$ per period and n = 16

$$S = 200\left[\frac{(1+0.03)^{16+1}-1}{0.03}\right]-200$$

$$= 200\left[\frac{(1.03)^{17}-1}{0.03}\right]-200 = 200\left[\frac{1.65284763-1}{0.03}\right]-200$$

$$= 200\left[\frac{0.65284763}{0.03}\right]-200 = 200(21.76158767)-200$$

$$= \text{Rs. } 4352.32 - \text{Rs. } 200 = \text{Rs. } 4152.32$$

-:4.17:-

A house is rented for Rs. 900 per month, with each month's rent payable in advance. If the interest rate is 12% compounded monthly and the rent is deposited in an account, what is the amount of rent for one year?

SOLUTION

$$S = R\left[\frac{(1+i)^{n+1}-1}{i}\right] - R$$

Here R = Rs. 900, $i = {}^{12\%}/_{12} = 1\%$ per period and n = 12

$$S = 900\left[\frac{(1+0.01)^{12+1}-1}{0.01}\right] - 900 \Rightarrow 900\left[\frac{(1.01)^{13}-1}{0.01}\right] - 900$$

$$= 900\left[\frac{1.13809328-1}{0.01}\right] - 900 \Rightarrow 900\left[\frac{0.13809328}{0.01}\right] - 900$$

$$= 900(13.809328) - 900 = \text{Rs. } 12428.40 - \text{Rs. } 900 = \text{Rs. } 11528.40$$

-:4.18:-

Find the present value of an annuity of Rs. 100 paid at the end of each year for 17 years if the interest rate is 7%, compounded annually.

SOLUTION

By Formula:

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

Here R = Rs. 100, i = 7% and n = 17

$$P = 100\left[\frac{1-(1+0.07)^{-17}}{0.07}\right] = 100\left[\frac{1-(1.07)^{-17}}{0.07}\right]$$

$$(1.07)^{-17} = 0.31657439$$

So $$P = 100\left[\frac{1-0.31657439}{0.07}\right]$$

$$= 100\left[\frac{0.68342561}{0.07}\right] = 100(9.763223) = \text{Rs. } 976.32$$

By Table: From table:

$$P = R.{}^{a}\overline{n}|i$$

$${}^{a}\overline{17}|7\% = 9.7632299$$

$$P = 100(9.763223) = \text{Rs. } 976.32$$

:4.19:-

Find the present value of an annuity of Rs. 100 paid at the end of each year for 8 years if the interest rate is 8% compounded semiannually.

SOLUTION

By Formula;

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

Here R = Rs. 100, $i = {}^{8\%}/_{2} = 4\%$ per period and n = 16

$$P = 100\left[\frac{1-(1+0.04)^{-16}}{0.04}\right] = 100\left[\frac{1-(1.04)^{-16}}{0.04}\right]$$

$$(1.04)^{-16} = 0.53390818$$

So $$P = 100\left[\frac{1-0.53390818}{0.04}\right]$$

$$= 100\left[\frac{0.46609182}{0.04}\right] = 100(11.6522955)$$

$$= \text{Rs. } 1165.23$$

By Table: From table:

$${}^{a}\overline{16}|4\% = 11.65229561$$

$$P = R.{}^{a}\overline{n}|4\%$$

$$= 100(11.6522955) = \text{Rs. } 1165.23$$

:4.20:-

A man wishes to deposit enough money today so that his son can withdraw Rs. 2500 at the end of each year for ten years. How much he deposit, if the interest rate is 6% compounded annually.

SOLUTION

By Formula:

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

Here R = Rs. 2500, i = 6% and n = 10

$$P = 2500\left[\frac{1-(1+0.06)^{-10}}{0.06}\right] = 2500\left[\frac{1-(1.06)^{-10}}{0.06}\right]$$

$(1.06)^{-10} = 0.55839478$

So $P = 2500\left[\frac{1-0.55839478}{0.06}\right] = 2500\left[\frac{0.44160522}{0.06}\right]$

$= 2500(7.360087) = \text{Rs. } 18400.22$

By Table: From table:

$a\overline{|10|}6\% = 7.360087$

$P = R.a\overline{|10|}6\%$

$= 2500(7.360087) = \text{Rs. } 18400.22$

:4.21:-

What is the present value of an annuity if the size of each payment is Rs. 2000 payable at the end of each quarter for eight years at an interest rate of 7% compounded quarterly.

SOLUTION

Here R = Rs. 2000, $i = {}^{7\%}/_{4} = 1.75\%$, n = 32 quarters

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

$$= 2000\left[\frac{1-(1+0.0175)^{-32}}{0.0175}\right] = 2000\left[\frac{1-(1.0175)^{-32}}{0.0175}\right]$$

Let $x = (1.0175)^{-32}$

Taking log of both sides

$\log x = -32\log(1.0175)$

$= -32(0.007534417) = -0.241101372$

$= -1 + 1 - 0.241101372 = 1.758898628$

Taking antilog of both sides

$$x = 0.5739824685$$

$$P = 2000\left[\frac{1-0.5739824685}{0.0175}\right] = 2000\left[\frac{0.426017532}{0.0175}\right]$$

$$= 2000[24.34385897] = \text{Rs. } 48687.72$$

:4.22:-

What is the present value of an annuity of Rs. 300 per year if the first payment is received today and yearly for a total of 10 consecutive payments, and money is worth 5% interest compounded annually?

SOLUTION

By Formula:

$$P = R\left[1+\frac{1-(1+i)^{-(n-1)}}{i}\right]$$

Here R = Rs. 300, i = 6% and n = 10

$$P = 300\left[1+\frac{1-(1+0.06)^{-(10-1)}}{0.06}\right] = 300\left[1+\frac{1-(1.06)^{-9}}{0.06}\right]$$

$$= 300\left[1+\frac{1-0.59189846}{0.06}\right] = 300\left[1+\frac{0.40810154}{0.06}\right]$$

$$= 300(1+6.801692333) = 300(7.801692333) = \text{Rs. } 2340.51$$

By Table: From table:

$$P = R\left[1+a\overline{n-1}\,i\%\right] = 300\left[1+a\overline{9}\,6\%\right]$$

$$a\overline{9}\,6\% = 6.80169227$$

$$P = 300(1+6.80169227) = 300(7.80169227) = \text{Rs. } 2340.51$$

-:4.23:-

The amount of an annuity for 12 years is Rs. 80000. What would be the size of the quarterly installment if the interest rate is 12% compounded quarterly?

SOLUTION

By Formula:

$$R = \frac{S}{\left[\frac{(1+i)^n - 1}{i}\right]}$$

We have S = Rs. 80000, $i = {}^{12\%}/_{4} = 3\%$, n = 48 periods

$$R = \frac{80000}{\left[\frac{(1+0.03)^{48} - 1}{0.03}\right]} = \frac{80000}{\left[\frac{(1.03)^{48} - 1}{0.03}\right]} = \frac{80000 \times 0.03}{4.13225188 - 1}$$

$$= \frac{80000 \times 0.03}{3.13225188} = \frac{2400}{3.13225188} = \text{Rs. } 766.22$$

By Table:

$$R = \frac{S}{s_{\overline{n}|i}} = \frac{80000}{s_{\overline{48}|3\%}}$$

$$s_{\overline{48}|3\%} = 104.40839598$$

$$R = \frac{80000}{104.40839598} = \text{Rs. } 766.22$$

-:4.24:-

Mr. Amjad wants to accumulate Rs. 60000 in 8 years. He makes equal deposits at the end of each 6 months in an account. The rate of interest is 8% compounded semiannually. Find the value of each deposit.

SOLUTION

By Formula:

$$R = \frac{S}{\left[\frac{(1+i)^n - 1}{i}\right]}$$

We have S = Rs. 60000, $i = {}^{8\%}/_{2} = 4\%$ per period, n = 16 periods

$$R = \frac{60000}{\left[\frac{(1+0.04)^{16} - 1}{0.04}\right]} = \frac{60000 \times 0.04}{(1.04)^{16} - 1}$$

$$= \frac{2400}{1.87298125 - 1} = \frac{2400}{0.87291825} = \text{Rs. } 2749.40$$

By Table:

$$R = \frac{S}{s_{\overline{n}|i}} = \frac{60000}{s_{\overline{16}|4\%}}$$

$$s_{\overline{16}|4\%} = 21.82453114$$

$$R = \frac{60000}{21.82453114} = \text{Rs. } 2749.40$$

-:4.25:-

Mr. Latif borrowed Rs. 200,000 from his friend to purchase a car. He promised to pay back the loan in semiannual equal installments in 3 years with interest rate at 8% compounded semiannually. If first payment is start at the end of first six monthly period, what would be the amount of each installment?

SOLUTION

By Formula:

$$R = \frac{P}{\left[\frac{1-(1+i)^{-n}}{i}\right]}$$

We have P = Rs. 200000, $i = {}^{8\%}/_{2} = 4\%$ per period, n = 6 periods

$$R = \frac{200000}{\left[\frac{1-(1+0.04)^{-6}}{0.04}\right]} = \frac{200000 \times 0.04}{1-(1.04)^{6}}$$

$$= \frac{8000}{1-0.79031453} = \frac{8000}{0.20968547} = \text{Rs. } 38152.38$$

By Table:

$$R = \frac{P}{a_{\overline{n}|i}} = \frac{200000}{a_{\overline{6}|4\%}}$$

$$a_{\overline{6}|4\%} = 5.24213686$$

$$R = \frac{200000}{5.24213686} = \text{Rs. } 38152.38$$

-:4.26:-

How many semi annual payments of Rs. 200 each to in a bank in the form of an ordinary annuity will accumulate Rs. 6000 if the interest rate is 8%.

SOLUTION

By Formula:

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

We have S = Rs. 6000, R = Rs. 200, i = 8%

$$6000 = 200\left[\frac{(1+0.08)^n - 1}{0.08}\right]$$

$$6000 = 200\left[\frac{(1.08)^n - 1}{0.08}\right]$$

$$(1.08)^n - 1 = \frac{6000 \times 0.08}{200}$$

$$(1.08)^n = 2.4 + 1 = 3.4$$

Taking log of both sides

$$n \log (1.08) = \log 3.4$$

$$n = \frac{\log 3.4}{\log 1.08} = \frac{0.531478917}{0.33423755} = 15.9 = 16$$

By Table:

$$S = R.{}^{s}\overline{n}|i$$

$${}^{s}\overline{n}|i = \frac{S}{R} = \frac{6000}{200} = 30$$

We consults the table under 8% and we find the value 30.324283 which gives n = 16.

-:4.27:-

The cash price of a car is Rs. 150000. If the interest rate is 24% compounded quarterly. How many quarterly payments he will take to pay off car, when quarterly payments of Rs. 15000 are made.

SOLUTION

By Formula:

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

We have P = Rs. 150000, R = Rs. 15000, $i = {}^{24\%}/_{4} = 6\%$

$$150000 = 15000\left[\frac{1-(1+0.06)^{-n}}{0.06}\right]$$

$$= 1-(1.06)^{-n} = \frac{150000 \times 0.06}{15000}$$

$$1-(1.06)^{-n} = 0.6$$

$$(1.06)^{-n} = 1 - 0.6 = 0.4$$

Taking log of both sides

$$-n \log(1.06) = \log 0.4$$

$$-n = \frac{\log 0.4}{\log 1.06} = \frac{-0.39794000}{0.025305865}$$

$$-n = 16 \text{ approx.} = 16 \text{ approx.}$$

By Table:

$$P = R.\,{}^{a}\overline{n}|i$$

$$150000 = 15000\ {}^{a}\overline{n}|6\%$$

$${}^{a}\overline{n}|6\% = \frac{150000}{15000} = 10$$

In table look down the column 6% for an entry close to 10. The nearest is 10.10589527 which corresponds to n = 16.

-:4.28:-

Mr. Usman wants to deposit his savings of Rs. 48000 in a bank. The bank offers 8% interest compounded semi annually. Find the number of withdrawals, if he draw Rs. 2400 at the end of each six months.

SOLUTION

By Formula:

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

We have P = Rs. 48000, R = Rs. 2400, $i = {}^{8\%}/_{2} = 4\%$

$$48000 = 2400\left[\frac{1-(1+0.04)^{-n}}{0.04}\right]$$

$$48000 = 2400\left[\frac{1-(1.04)^{-n}}{0.04}\right]$$

$$1-(1.04)^{-n} = \frac{48000\times 0.04}{2400}$$

$$1-(1.04)^{-n} = 0.8$$

$$(1.04)^{-n} = 1-0.8 = 0.2$$

Taking log of both sides

$$-n\log(1.04) = \log 0.2$$

$$-n = \frac{\log 0.2}{\log 1.04} = \frac{-0.698970004}{0.017033339}$$

$$-n = -41 \Rightarrow n = 41$$

By Table:

$$P = R.\,{}^{a}\overline{n}|i$$

$$48000 = 2400\ {}^{a}\overline{n}|4\%$$

$${}^{a}\overline{n}|4\% = \frac{48000}{2400} = 20$$

In table look down the column 4% for an entry close to 20. The nearest is 19.99305181 which corresponds to n = 41.

-:4.29:-

Mr. Zahid invests Rs. 540 at the end of each month amounts to Rs. 12644 in 1½ year. Find the nominal rate of interest.

SOLUTION

If S, R and n are given the rate of interest per period i can not be found with the help of logarithm as the value of the factor $[(1+i)^n - 1]$ cannot be determined if i is unknown. The possible solution will be found by use of annuity tables.

Here R = Rs. 540, S = Rs. 12644, n = 18 months

$$S = R.\,{}^{s}\overline{n}|i$$

$$13000 = 540\ {}^{s}\overline{18}|i\%$$

$${}^{s}\overline{18}|i = \frac{12644}{540} = 23.41481481$$

In table -2 look from left to right opposite n = 30, searching for the value nearest 23.41443547. Which occurs under 3%. The nearest rate is 3% per month or 12 × 3% = 36% compounded monthly.

-:4.30:-

An annuity of Rs. 8800 payable at the end of each year amounts to Rs. 120000 in 10 years. Find the interest of the annuity.

SOLUTION

Here S = Rs. 120000, R = Rs. 8800, n = 10

$$S = R.{}^{s}\overline{n}\rceil i$$

$$120000 = 8800\ {}^{s}\overline{10}\rceil i$$

$${}^{s}\overline{10}\rceil i = \frac{120000}{8800} = 13.63636364$$

In table -2 look from left to right opposite n = 10, the nearest value is 13.81644796 which occurs under 7% per year.

-:4.31:-

The GO company is expected to pay Rs. 4.0 every six months on a share of its stock what is the present value of this stock if money is worth 5% compounded semi annually?

SOLUTION

Here R = Rs. 4.0, n = $^{5\%}/_{2}$=2½%

$$P = \frac{R}{i} = \frac{4.0}{0.025} = \frac{4000}{25} = \text{Rs.}160$$

-:4.32:-

Find the present value of a company's stock, which is expected to pay Rs. 200 every three month, if money is worth 6% compounded quarterly.

SOLUTION

Here R = Rs. 200, n = $^{6\%}/_{4}$=1½%

$$P = \frac{R}{i} = \frac{200}{0.015} = \text{Rs.}13333.33$$