Effective interest rate:

Interest rates reflect economic condition of a country. the most common types of interest are
i) Simple interest ii) Compound interest.
Simple interest is paid on the principle while compound interest is computed on both the principle and the accumulated Interest.

The effective rate i_n of Interest in the n^{th} year is defined as the actual rate of increase per cost invested during that time is given by

$$i_n = \frac{a(n) - a(n-1)}{a(n-1)} = \frac{I(n)}{a(n-1)}$$

[Where $I(n)$ denotes the Interest in the n^{th} rates]

Simple interest:

Simple interest $a(n) = 1 + in$, where i denotes the rate of Interest per rupee per annum. Thus, with simple interest in the n^{th} year is given by,

$$i_n = \frac{1+in - 1 - i(n-1)}{1+i(n+1)} = \frac{i}{1+i(n-1)}$$

Rate of Interest

Introduction: Interest may be recorded a mean paid by one person [the prroner] for the uses of the an a asset [Capital] belonging to another person [the lender] Capital and need not be measured in terms of the same Commodity. for example. If a building is entred an monthly bases than the write to the use building premisses an we recorded as Capital and the rent paid every month can be recorded as interest the Capital is also reffered to as "Principal" and Interest is some time refered to as has derived.

Effective rate of Interest!

Let us Consider a unit time period investment of one unit made of time $t=0$ if this investment [mi unit] accumulates to [1+i] we say that "i" if the Interest against an one unit in one unit of time. this 'i' is defined as the effective rate of interest for the unit time Consider and 1+i is defined as the accumulation of 1 at the end of one unit of time & effective rate of interest i per unit time.

the effective rate of Interest for period can be defined as the total interest accured an one unit by the end of the period ~~Per~~

for eg. If an Investment of the rupees 100 of Interest per quater.

Let us now calculate the Interest accured at the end of n units of time for all this purpose ~~that~~ let us define f(t) to be the accured amount.

[accumulation] at the end of t units of ~~the~~ t units of time of an investment of 1 unit Inverstod at time t=0 Let "i" be the effective rate of Interest for unit time Period clearly. We have $f(0)=1$ by definition the accumulation at the end of [t=1] units of time is f(t=1). We therefore & that f(d) must be equalant f(t-1) · Invested at time t-1 Invested at time t-1 & "in the invest accurost an f(t-1) during the t^{th} unit Period i.e., i x f(t-1)

$$f(t) = f(t-1) + [i \times f(t-1)]$$

llly

$$f(t-1) = (1+i)\, f(i+2)$$

Sub equ ② in eq ① we have

$$f(t) = f(t-1)\cdot(1+i)$$

$$= [(1+i)\, f(t-2)]\,(1+i)$$

$$f(t) = (1+i)^2\, f(t-2)$$

& rescceding an similar lines we have

$$f(t) = (1+i)^{t-1}\, f(t)$$

$$= (1+i)^{t-1}$$

$$= (1+i)^{t-1+1}$$

$$f(t) = (1+i)^t$$

∴ If I unit of Capital is invested for n units of time at the effective rate of interest of "i" per unit of time than the accumulation at the end of n unit of time will be $(1+i)^{n-1}$

i.e, $f(n) = (1+i)^n$ only for all real values of n the interest accured by the end of n unit of time is there obtain by subracting the capital from the accumulation

$$\text{Total interest} = (1+i)^n - 1$$

Simple interest [I]

Simple interest is computed an the principal for the period of the ~~processing~~ prowing. the Simple interest [I] on principal a prarwaved at the rate of PA for a period of n years is given by the formula $I = Pnr$. The amount acculate at interest i those $A = P+I = P+Pnr \Rightarrow A = P(1+nr)$

Nominal rate of interest : $i^{(m)}$

0   1/m   2/m   3/m   . . .   n/m = 1

Let us consider a unit time period. Let these time period can be divided into "m" = m quater of length 1/m. If i is the effective rate of interest for monthly time period then mi is defective to be the nominal rate interest per time

The acturial language the nomial rate of Intorest Per annum Convertable m times a year is denoted by the simple in which means the acturial effective rate is interest for monthly period is $\frac{im}{m}$

The nominal rate is Interest per annum convertable m times as year I's also called the nominal rate of interest payable m time a year.

Relationship between Effective rate interest and Nominal rates of Interest:

	Effective rates of Interest	Nominal rate of Interest
i)	Interest rate is only meaning in the contract of time - in general is under stand as per year which is called rate for the sub periods as a period can be calculated as $ie = (in+1)^{n/n}$	Interest rate with other periods of time then year - like month, week, day, the interest rate may be called nominal interest rate. For a period wider interest rate for it. Periods can be calculated as $i = (1+ie)^{n}-1$
ii)	Nominal interest rate with effective monthly interest rates - Effective interest for per month with a nominal rate of can be calculated as $ie = (i/0+1)^{1/10}-1$ $ie = [1 \cdot 1+1]^{1/12}-1$ $= 0.0079 \times 100 = 0.79\%$	Where i - nominal interest rate for the period, ie = effective interest for sub period n = no. of sub period.

Effective rate of the Interest (m)

Corresponding to the nominal rate of interest (Im)

If Im is the nominal rate of Interest Per annum invertable m time a year then I^{m}/m is the effective rate of Interest Per monthly Period to a Year and hence total interest actured an one unit in a year is

$$\left[1+\frac{i^{m}}{m}\right]^{m}-1$$

$$i=\left[\frac{1+i^{m}}{m}\right]^{m}-1 \rightarrow ①$$

The nominal rate of interest Per annum Convertable m times a year Corresponding to the effective rate of Interest PA is given by,

$$i^{m}=\left[m\left[(1+i)^{1/m}-1\right]\right]$$

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

$$\left[1+\frac{i^{(m)}}{m}\right]=(+i)^{1/m}$$

$$\frac{i^{(m)}}{m}=(1+i)^{1/m}-1$$

$$i^{(m)}=m\left[(1+i)^{1/m}-1\right] \rightarrow ②$$

from the relative ① & ② We Cannot nominal Convert rate into effective rate of Vice Versa.

FORCE OF INTEREST :- DEFINITION :

the nominal rate of interest per period convertable m - times the period is denoted by i^{m}. If the frequency with which Interest is convertable increasing indefinitely.

(i.e.,) ~~m=∞~~ $m \to \infty$ then we have a Quantity "Force of interest". the force of Interest per period can be defind as the nominal rate of Interest can be difined as the nominal rate of Interest per period convertable momently of continuously or uniformly it is denoted by i^{th} or δ.

Effective Rate of interest.

Let us suppose that Re 1 is due at end of a period instant of making this of Re 1. if the time period 1 may suitable immediate payamount which is earn to the present value of Re. 1 at the given rate of interest.

If i is the effective rate of interest period than the Immediate payamount m be $1 \times v$ [at the rate of i per period].

Definition: the difference between the payamount of Re. 1, which may be paid at the end period and the immediate payamount which must be paid at the v. of per and is denoted of the symbol d. The effective rate of discounts per period corresponding to the effection rate of interest per period is given by

$$d = 1 - v$$

$$= 1 - \frac{1}{1+i} \Rightarrow \frac{1+i-v}{1+i} = i/_{1+i}$$

$$d = i\left(\frac{1}{1+i}\right)$$

Nominal Rate of interest.

the discount $[1 - v^{1/m}]$ is defined to as the effective rate of a discount per period of the yea
the nominal rate of period convertable m times a period is denoted by $d^{(m)}$. We have,

$$d^{(m)} = m(1 - v^{1/m})$$

Relationship between nominal rate of discount and nominal rate of Interest (or) Relation between $i^{(m)}$ and $d^{(m)}$

$$d^m = m(1 - v^{1/m}) \Rightarrow m\left[1 - \left(\frac{1}{1+i}\right)^{1/m}\right]$$

$$= m\left[\frac{(1+i)^{1/m} - (1)^{1/m}}{(1+i)^{1/m}}\right] \Rightarrow \frac{i^{1/m}}{(1+i)^{1/m}}$$

$$\boxed{d^m = i^{(m)} v^{1/m}}$$

Present Value [PV] :

Let us suppose that Re. 1 is due "n" periods. Hence, Let the rate interest be the i per period effective if x is the present value of this Re. 1 due n period hence by definition this Re. 1 must be the accumulated value of Invested at time $t=0$

We have.

$$x(1+i)^n = 1 \Rightarrow x(1+i)^n = 1$$

$$x = \frac{1}{(1+i)^n} \Rightarrow (1+i)^{-n} \quad \left(\text{Since } v = \frac{1}{1+i}\right)$$

If the define $x = v^n$

$$v = \frac{1}{1+i} - (1+i)^n = (1+i)^{-1}$$

Then the present value of Re. 1 due n years hence will be v^n.

Annuity:

A serial of periodic payments or a special type of cash flow where payments at regular intervals is known as an annuity.

Example: Annuites are common in our day to interactions most of us make and receive periodic payments.

For example; monthy rent monthy telephone bills, salaries paid on regular basis, monthly scholarship equal monthy Installments for repayment of hour loan or car loan etc.

A certain amount of money known as principal, that is invested for a certain period of time at a certain rate of interest, be paid out in a series of periodic payment over a strated period of time.

Continuous Annuity: An annuity in which payment are made continuously at the rate t unit per amount is known as continuous Annuity.

Annuity Due: An annuity due, also known as annuity payable annually in advance, is an annuity in which payments are made at the beginning of the year.

Annuity immediate: An annuity Immediate also known as annuity payable annually in arrear is an annuity in which payments average made at the end in the year.

The terms, annuity due and annuity immediate do not seem to be logical but there are conventially used in the insurance field as defined above. the first payments of an annuities Immediate is not made immediatly. at the beggining of the first payment period, rather it is due at the end of it. the other corresponding terms. annuity payable annually in advance and in arrear. for annuity due and Immediate respectively are more logical.

An annuity period may be a month or a quater or six months instead of a year. Such divisions of a year leads to the following types of annuity.

Accumulation of Annuity:

the present value of a series of payments in a certain time period looks at the values of cash flow in that period at the beginning of the period. Sometimes we need to find the value of of the cash flow at the end of the period. the general symbol for accumulated at a given rate of Interest . .

Annuity :-

Payments each of one unit for n years at the end of the year. the accumulation value of $a_{\bar{n}}$ at rate of Interest i, a end of n years i $(1+i)$ $a_{\bar{n}}$. It is denoted by $S_{\bar{n}}$. thus

$$S_{\bar{n}} = (1+i)^n a_{\bar{n}}$$

The accumulated value of 1 unit paid at the end of 1 year is $(1+i)^{n-1}$ that of at the end of second year is $(1+i)^{n-2}$ and so on, the accumulated value of 1 unit paid at the end of the n^{th} year is 1. thus.

$$S_{\bar{n}} = (1+i)^{n-1} + (1+i)^{n-2} + \cdots + (1+i)$$

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

$$= (1+i)^n \quad (1-i+i)^{-n})/i$$

$$= (1+i)^n (1-v)^n / i = (1+i)^n$$

$S_{\bar{n}}$ thus denote the value of the series unit payments at the time of last payment It is clear that $(I=1)$.

It is to be noted that $a_{\bar{n}}$ represents the of the Cash flow in the period of n years at the beginning of the period ~~write~~ while $S_{\bar{n}}$ representing the value of the cash flow in the period.

Increasing Annuity:

the increase in the benefit of the insurance can occur more frequently than one per year. for an monthly increasing whole life insurance. The benefit would be $1/m$ at the moments of death during the first m^{th} part of the years of a term of the insurance, $2/m$ at the moment of death during the second m^{th} part of a year, during the term of the insurance, and so on, increasing by $1/m$ at m^{th}ly intervals throughout the term of the Insurance. for such a whole life insurance the functions are.

$$b_t = \frac{\lfloor tm+1 \rfloor}{m} \quad \text{if } t \geq 0,$$

$$Z = v^T \frac{\lfloor Tm+1 \rfloor}{m} \quad \text{if } T \geq 0.$$

Note that if death occures in the first m^{th} part then $t < 1/m$, that is $mt < 1$. Hence, $\lfloor tm+1 \rfloor$ is 1, so that $b_t = 1/m$. Similarly, if death occures in the second m^{th} part then $1/m < t < 2/m$, that is $1 < mt < 2$

Hence ; $[tm+1]$ is 2, so that $b_t = 2/m$ the actuarial present value is denoted by

$$E(ZT) = (I^{(m)}\bar{A})_x$$

the limiting case, as $m \to \infty$ in the m^{th} ly increasing whole life Insurance, is a insurance paying at at the time of death. In functions are, $b^t = t \quad t \geq 0$, $Z = T v^T \quad T \geq 0$

the acturial present value symbol for an Increasing whole life insurance

$(\bar{I}A)_x$ and it is given by

$$(\bar{I}A)_x = \int_0^\infty t v^T \, {}_tp_x \, \mu_{x+t} \, dt.$$

Decreasing Annuity :

If for m^{th} ly increasing life Insurance the benefit is payable only if the death occur with in a term of n years, the Insurance in m^{th} ly increasing n years term life insurance.

Compremontry in the annually increasing year term life insurance is the annually decreasing n year term life Insurance pre n at the moment of death during the first year, n-1 at the moment of death during the second year and so on. with coverage terminating at the end of the n^{th} year.

an Insurance has the following functions:

$$b_t = \begin{cases} n-[t] & \text{if } t \leq n \\ 0 & \text{if } t > n \end{cases}$$

$$z = \begin{cases} v^T (n-[T]) & \text{if } T \leq n \\ 0 & \text{if } T > n. \end{cases}$$

The actuarial present value for this Insurance is

$$(\bar{D}\bar{A})^1_{x:\overline{n}|} = \int^n v^t (n-[t]) \, {}_tp_x \, \mu_x$$

this insurance is complementary to the annually increasing n year insurance in the sense that the sum of their benefit functions is the constant n+1 for the n year term. We may wonder what is the use of decreasing benefit.

the following exam illustrates how the model of decreasing benefit Insurance is applicable in practice. further it also illustrates how the theory developed for Insurance on human lives is also applicable for other objects such as machines, loans, warranties etc

Ex. No: 1

The effective rate of a p.a on a certain loan is as present 18%. Let in 2 years time it will be reduce to 16% and 3 years the

i) accumulation of the loan in 5 years time assuming the loan borrowed is Rs 12,000

ii) Accumulation at the end of 4 ¼ yr is a loan of 18,000 is garanted.

Solu:

i) Let S to be accumulated of the loan at the end 5 yr

$S = P(1+i)^n \Rightarrow 10,000\,[1+0.18]^2\,[1+0.16]^3$

$= 10,000\,[1.3924]\,[1.560896]$

$S = 21,733.9159$

ii) Let S to be the accumulation of the loan at the end of 4 ¼ yr.

$S = P(1+i)^n \Rightarrow 18,000\,(1+0.18)^2(1+0.16)^{2\frac{1}{4}}$

$= 18000\,(1+0.18)^2\,(1+0.16)^{2.25}$

$= 18000 \times 1392 \times 1.396$

$S = 34,988.22$

Ex. No: 2

A man Interest Rs 20,000 with bank if the accumulate amount of the investment at the end of 6 months is Rs. 20596.2. find the effective rate of p.a by interest.

Solu:- Let i be the effective rate of interest p.a are given

$S = P(1+i)^n \Rightarrow 20596.21 = 20,000 (1+i)$

$20596.21 = 20,000 (1+i)^{1/2} \Rightarrow \frac{20596.21}{20,000} = (1+i)$

$1.0298105 = (1+i)^{1/2} \Rightarrow [1.0298105]^2 = [(1+i)]$

$1.060509666 = (1+i)$

$1.060509660 = 1+i$

$1.060509666 - 1 = i$

$0.06050 = i$

$0.06050 \times 100 = i$

$0.0 = i$

Ex-NO:3

find the effective rate of p.a corresponding the nominal rate a 6% p.a convertable 1/4 (quarterly)

Solu:-

We have

$i^{(m)} = m\left[(1+i)^{1/m} - 1\right]$

$i^m = 6/100$

$i^m = 0.06$

$m = 4$

the effective rate of Interest (i)

$i = \left[1 + \frac{i^m}{n}\right]$

$i = \left[1 + \frac{0.06}{4}\right]^4 - 1 = 0.0613 \times 100$

$i = 6.136\%$

4. there the nominal rate corresponding to the effective rate of 6.636 %. P.A

Ex. NO: 4

P = Principla amount of Capital amount Rs. 10,000

$n = 10$ yrs

$i = \frac{12}{100} = 0.12$

$S = P \times (1+i)^n \Rightarrow 10,000 \times (1+0.12)^{10}$

$= 10000 \times 3.1058$

$S = 31058.843$

Ex. NO: 5

Assume that Rs. 2000 is invested for 12 years find the accumulation is at rate of Interest is 15% PA

Solu

$S = P(1+i)^n \Rightarrow 2000\ (1+0.15)^{12}$

$= 2000\ (5.3502)$

$S = 10700.500$

i) Half yearly

the effective rate of interest $\} = \left[1 + \frac{i^m}{m}\right]^m - 1$

$i = \left[1 + \frac{i^{1/2}}{2}\right]^{1/2}$

$= \left[1 + \frac{12\%}{2}\right] - 1 \Rightarrow [1 + 0.12]^2 - 1$

$= [1 + 0.062]^2 - 1$

$= 0.1236 \times 1000$

$i = 12.36.$

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ii) Quarterly $i = \left[1 + \frac{12\%}{4}\right]^4 - 1$

$= \left[1 + 0.03\right]^4 - 1$

$i = 0.1255 \times 100$

$i = 12.5508$

iii) Monthly.

$$i = \left[1 + \frac{12\%}{12}\right]^{12} - 1$$

$= \left[1 + 0.01\right]^{12} - 1 \Rightarrow 0.1268 \times 100$

$i = 12.6825$

$$i = \left[1 + \frac{12\%}{1/2} + 2\right]^{1/2} - 1 \quad 1/2$$

EX.NO:6

A men, female inverst Rs. 18,000 if the bank, if the accumulated amount of the inverstment at the end of 4 1/4 is Rs. [redacted] 34,999.

Find the rank of interest PA

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

$34999.92 = 18.000\,(1+i)^{4\frac{1}{4}}$

$$\frac{34999.92}{18,000} = (1+i)^{17/4}$$

$1.94444 = (1+i)^{17/4}$

$(1+i) = (1.94444)^{4/17}$

$= (1.94444)\ 235$

$(1+i) = 1.1691$

$i = 1.1691 - 1 \Rightarrow i = 0.1691 \times 100$

$i = 16.91$

$i = 17\%$

Ex. No: 7

Find the effective rate of interest corresponding to the nominal rate of interest 12 % PA.

$i = [1+24\%]^{1/2} - 1 \Rightarrow [1+0.24]^{0.5} - 1$

$i = 0.1135 \times 100$

$i = 11.35$

Ex. No: 8

Find the effective rate of interest corresponding to the nominal rate of interest 8 % PA

i) Monthly ii) Quarterly iii) binearly i) Half yearl

Solu:

i) Monthly

$$i = \left[\frac{1+i\ M}{m}\right]^{m} - 1$$

$$= \left[\frac{1+8}{12}\right]^{12} - 1 \Rightarrow [1+0.006]^{12} - 1$$

$= 0.0821 \times 100$

$i = 8.213$

ii) Quarterly

$$i = \left[\frac{1+8\%}{4}\right]^{4} - 1$$

$= [1+0.02]^{4} - 1$

$= 0.082 \times 100$

$i = 0.21$

iii) binary

$$i = \left[\frac{1+8\%}{1/2}\right]^{1/2}$$

$$i = [1.16]^{1/2} - 1 \Rightarrow 0.077 \times 100$$

$$i = 7.70$$

iv) Half Yearly

$$i = \left[1 + \frac{8\%}{2}\right]^2 - 1$$

$$= [1+0.04]^2 - 1 \Rightarrow 0.81 \times 100$$

$$i = 8.16$$

Ex. No: 9

Find the nominal rate of interest converting

1). Half Yearly corresponding be the effective rate of interest of 6

2) Convertable quarterly be the effective rate of Interest

3) Convertable montly of the quate rate of interest 12% PA.

Solu:- 1. Half Yearly

$$i^m = [m \times (1+i)^{1/m} - 1]$$

$$= 2[1+0.06]^{1/2} - 1 \Rightarrow 2[1.06]^{1/2} - 1$$

$$= 2[0.059] \times 100$$

$$i = 5.912$$

② Quarterly

$$i^m = 4\left[1+8\%\right]^{1/4} - 1 \rightarrow 4\left[1+0.08\right]^{0.25} - 1$$

$$= 0.077 \times 100$$

$$i^m = 7.77$$

③ Monthly

$$i^m = 12\left[1+12\%\right]^{1/12} - 1$$

$$= 12\left[1.12\right]^{0.0833} - 1$$

$$= 12\left[1.009\right] - 1 \Rightarrow 0.1138$$

$$i^m = 11.38$$

EX.NO: 10

find the nominal rate of discount per a convertable quarterly corresponding to the nominal rate of discount 38%. PA convert half yearly.

Solu

Half yearly $d^m = m(1 - v^{1/m})$

$$d^4 = ?$$

$d^4 = 4\left[1 - v^{1/4}\right]$ and

$$d^2 = 2\left[1 - v^{1/2}\right]$$

$$d^2 = 0.38$$

$$2(1 - v^{1/2}) = 0.38$$

$$(1-v)^{1/2} = \frac{0.38}{2}$$

$$(1-v)^{1/2} = 0.19$$

$$-v^{1/2} = 0.19 - 1 \Rightarrow -v^{1/2} = 0.8$$

$$v^{1/2} = 0.81 \Rightarrow v = (0.81)^2$$

$$v = 0.654$$

$$d^4 = 4\left[1-(0.656.1)^{1/4}\right]$$

$$= 4\left[1-(0.656.1)^{0.25}\right]$$

$$= 4\left[1-0.9\right]$$

$$d^4 = 0.4$$

EX. NO: 11

Find the rate of Interest i

$$d^m = i^m$$

Solu

$$d^m = i^m$$

$$i^m \; v^{1/m} = i^m \Rightarrow v^{1/m} = \frac{i^m}{i^m}$$

$$v^{1/m} = 1$$

$$v = 1^m$$

$$\boxed{v = 1}$$

$$v = \frac{1}{1+i}$$

$$1 = \frac{1}{1+i}$$

$$1+i = 1$$

$$i = 1-1$$

$$\boxed{i = 0}$$

Nominal rate of interest and nominal rate of discount is equal

EX. NO: 12

How much a person Should interested to be Rs. 10,000 at the end of 6 years then the interest is 8% PA

Solu:

$$X = \frac{A}{(1+i)^n}$$

$A = 10000$, $n = 6$ yrs, $i = 8\% = 8/100 = 0.08$

$$X = \frac{10000}{(1+0.08)^6} \Rightarrow \frac{10000}{(1.08)^6} \Rightarrow \frac{10000}{} \Rightarrow \boxed{X = 6301.5943}$$

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Ex. No: 13

A Person Should inverstod to received at the end of 6th year if the rate of Interest is

i) 8% PA Convertable half year

ii) " Quarterly

iii) " Monthly

iv) " momently

Solu:-

i) Half yearly

$$x = \frac{A}{\left(\frac{1+i^m}{m}\right)^{m\times n}}$$

$$x = \frac{10000}{1+\left(\frac{0.08}{2}\right)^{2\times 6}}$$

$$\boxed{x = 6246.096}$$

ii) Quarterly

$$x = \frac{10000}{\left(1+\frac{0.08}{4}\right)^{4\times 6}} \Rightarrow \frac{10000}{1.6084}$$

$$\boxed{x = 6217.3580}$$

iii) Monthly

$$x = \frac{10000}{\left(1+\frac{0.08}{12}\right)^{12\times 6}} \Rightarrow \frac{10000}{1.6135}$$

$$\boxed{x = 6197.706}$$

iv) Monthly

$$x = \frac{A}{(1+i)^n} \Rightarrow i = e^{\sigma}-1$$

$$i = \frac{10000}{(1+e^{\sigma}-1)^n} \Rightarrow \frac{-10000}{(e^{\sigma})^n}$$

$= \frac{10000}{1.6161}$

$\boxed{i = 6187.8339}$

EX-NO: 1

How much interest should be earned at 6% simple Interest for 2 year

Solu:-

$I = Pnr \Rightarrow 2000 \times 2 \times 6/100$

$\boxed{I = 240}$

EX-NO: 2

The amount ~~to~~ barrowed after 6 month Rs. 1050 barrowed amount is 1000

Solu:

WKT $A = P(1+nr)$

$A = P(1+nr) \Rightarrow 1050 = 1000\ (1+1/2\ r)$

$1050 = 1000\ (1 + r/2)$

$\frac{1050}{1000} = 1 + r/2 \Rightarrow 1.05 = 1 + r/2$

$1.05 - 1 = r/2 \Rightarrow 0.05 = r/2$

$2 \times 0.05 = r \Rightarrow r = 0.1$

$r = 0.1 \times 100 \Rightarrow r = 0.1$

$r = 0.1 \times 100$

$\boxed{r = 10}$

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UNIT - II   18KP3SELS4

ACTUARIAL SCIENCE

Repayment Installment.

Definition.

Repayment Installment means any Installment of a Tranche to be repaid by the Borrowers under Clause 6 (Repayment).

Repayment Installment means each instalments of Repayment of the facility A Loans reffered to in (Facility of loans)

Equal Total payments

For equal total payments loans, calculate the total amount of the periodic payment using the following formula

$$B = (i \times A) / [1 - (1+i)^{-N}]$$

A = amount of loan.

B = Periodic total Payment

N = Total number of periods in loan

The principal portion due in periods n is

$$C_n = B \times (1+i)^{-(1+N-n)}$$

where,

C = principal portion due

n = Period under consideration

the interest Due in Period n is $I_n = B - C_n$

the remaining principal balance due after Periods n is : $R_n = (I_n / i) - C_n$.

Equal Payment principal :

For equal principal payment loans, the principal portion of the total payment is calculated as : $C = A / N$

The interest due in period n is $I_n = [A - C(n-1)] \times i$

the remaining principal balance due after Period n is $R_n = (I_n / i) - C$

Capital Interest

Consider an investment of C for t time units at the end of which $S = C + I$ is returned. then we call t the term, I the interest and S the accumulated value of the initial capital C.

i. $I = tC$

Definition :

$I = I_{simp}(i; t; c) = t i c$ is called simple interest on the initial capital c

$S = S_{simp}(i; t; c) = c + I_{simp}(i; t; c)$ is called simple interest of the ~~initial~~ accumulated value of c.

Annuity Taxations :

Although annuities are considered a hedge against income taxes, the Internal Revenue Service is still likelly to take some of the money you withdraw or payments you receive when the time comes.

One of the main tax advantages of annuities is they allow investment to grow tax - free until the funds are withdrawn.

But this seemingly simple perk is accompained by a raft of complicated rules about what funds are taxed, how they are taxed and when they are taxed.

Loan Repayment Schemes

A Repayment Scheme for a loan of amount L at force of Interest $\lambda(\cdot)$ is a cash flow

$$C = ((t_1, x_1), (t_2, x_2) \cdots (t_n, x_n))$$

Such that

$$L = DValo(C) = \sum_{K=1}^{n} v(t_n)\, x_n$$

$L \rightarrow (1)$

Condition (1) ensures that, in the model given by $\lambda(\cdot)$, the loan is repaid after the n^{th} payment since it means that the cash flow $((0, -L), C)$ has zero value at time 0, and

then $L = x\, a_{\overline{n}|}$

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