Page No.
Date : / /20

Assignment -I

Sol (i)

(1)

$d^{4} = 8\%$

$\delta = ?$

$$\left(1-\frac{d^{4}}{4}\right)^{4} = e^{-\delta(1)}$$

$$(1-0.02)^{4} = e^{-\delta}$$

$$\ln(0.922368160) = -\delta$$

$$\delta = 0.08081$$

$$\boxed{\delta \Rightarrow 8.081083\%}$$

(2)

$$1+i = e^{\delta}$$

$$i = e^{\delta}-1$$

$$\boxed{i = 8.41657\%}$$

(3)

$$\left(1-\frac{d^{4}}{4}\right)^{4} = \left(1-\frac{d^{12}}{12}\right)^{12}$$

$$\left[0.9223682\right]^{\frac{1}{12}} = \left(1-\frac{d^{12}}{12}\right)$$

$$\boxed{d^{12} = 8.053929}$$

Page No.
Date : / /20

Ques (2) (i) $\delta(t) = 0.004t + 0.0002t^2$

$$PV_0 = 1000 \times e^{-\int_0^{10} \delta(t)\,dt}$$

$$= 1000 \times e^{-\int_0^{10} (0.004t + 0.0002t^2)\,dt}$$

$$= 1000 \times e^{-\left[0.002t^2 + \frac{0.0002t^3}{3}\right]_0^{10}}$$

$$= 1000 \times e^{-\left[0.002(100) + \frac{0.0002}{3}(1000)\right]}$$

$$= 1000 \times e$$

$$\boxed{PV_0 = 765.9283384}$$

(ii) $1000 \cdot AV_{10} = 765.9283384 \times (1+i)^{10}$

$$\left[\frac{1000}{765.928}\right]^{1/10} = 1+i$$

$$\boxed{i = 2.7025404}\%$$

Ques (3) (i) Since we know, $d = \frac{i}{1+i}$

and $\frac{1}{1+i}$ can be written as v i.e discount factor

$$\boxed{d = iv}$$

(II) a) $(1+d)^4 = \left(1 - \frac{d^2}{2}\right)^{+2}$

$$(1 - 0.0225)^2 = \left(1 - \frac{d^2}{2}\right)$$

$$\boxed{d^2 = 8.89875\%}$$

Page No.
Date / /20

(b) $\left(1-2d^{1/2}\right)^{1/4} = \left(1-\frac{d^{2}}{2}\right)^{2}$

$\left[1-2(0.05)\right]^{1/4} = \left[1-\frac{d^{2}}{2}\right]$

$\boxed{d^{2} = 5.19925\%}$

(iii) $i = 0.05$

$(1+i)^{\frac{91}{365}} = \left(1-\frac{91}{365}d\right)^{-1}$

$(1.05)^{-\frac{91}{365}} = 1-\frac{91}{365}d$

$\boxed{d = 4.84946\%}$

Ans 4: (i) Similar done 3(i)

(ii) $i = 0.08$

a) $(1+i) = \left(1-\frac{d^{12}}{12}\right)^{-12}$

$(1.08)^{-\frac{1}{12}} = 1-\frac{d^{12}}{12}$

$\boxed{d^{12} = 7.671477\%}$

Date : / /20

b) i^{365}

$$1+i = \left(1+\frac{i^{365}}{365}\right)^{365}$$

$$(1.08)^{\frac{1}{365}} = 1+\frac{i^{365}}{365}$$

$$\boxed{i^{365} = 7.6969\%}$$

c) $\delta = ?$

$$\ln(1+i) = \delta.$$

$$\ln(1.08) = \delta$$

$$\boxed{\delta = 7.6961\%}$$

d) $i^{0.5}$

$$1+i = \left(1+\frac{i^{0.5}}{0.5}\right)^{0.5}$$

$$(1.08)^{\frac{1}{0.5}} = 1+\frac{i^{0.5}}{0.5}$$

$$\boxed{i^{0.5} = 8.32\%}$$

Page No.
Date: / /20

Que 5 (i) $d^{4} = 6\%$

a) $\left(1+\frac{i^{2}}{2}\right)^{2} = \left(1-\frac{d^{4}}{4}\right)^{-4}$

$\left(1+\frac{i^{2}}{2}\right) = \left(1-\frac{0.06}{4}\right)$

~~$i^{2} = 0.0$~~ $\boxed{i^{2} = 6.13775\%}$

b) $\left(1-\frac{d^{12}}{12}\right)^{12} = \left(1-\frac{d^{4}}{4}\right)^{4}$

$\left(1-\frac{d^{12}}{12}\right) = \left(1-\frac{0.06}{4}\right)^{\frac{1}{3}}$

$\boxed{d^{12} = 6.03025\%}$

(ii)

200,000 ———— 2,20,000

$2,20,000 = 200000(1+i)$

$\boxed{i = 0.1}$

Time Period b/w 15th April 2005 to 17th July 2005 ≅ 3 Months.

Sum Paid on 17th July 2005 $\Rightarrow (1+i)^{\frac{3}{12}} \times$ ~~20,0000~~ 2,00,000

$\Rightarrow \boxed{204822.7373}$

DOUB!

Ques (6)

~~$0.7 = 1(1-d)$~~

~~$70 = 75$~~

~~$x = 1$~~

~~Retail Price $= R$~~

~~$x = R \times (1-0.03)$ (cash repayment)~~

~~$y = R \times (1-0.25)^2$ (credit).~~

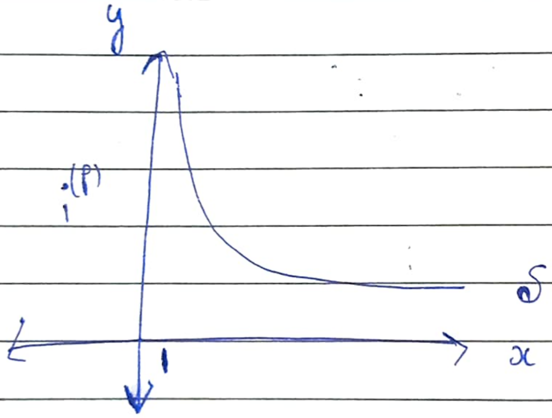
~~$\frac{x}{y} = \frac{R(1-0.03)}{R(1-0.25)^2} = 1-d$~~

$\Rightarrow$

Ques (6) (i) $\frac{0.70}{0.75} = 1-d.$

$$\boxed{d = 6.6667\%}$$

Ques (8)



On increasing the value of 'p', the nominal rate of interest $[i^{(p)}]$ tends to get closer to the value of force of interest (δ).

(6) (ii)

$d^{12} = [1-(1-d)^{1/12}] \times 12.$	$i^{(2)} = [(1-d)^{-1/2} - 1] \times 2$	$\delta = -\ln(1-d).$
$d^{12} = [1-(1-0.06667)^{1/12}] \times 12$	$i^{(2)} = [(1-0.06667)^{-1/2} - 1] \times 2$	$\delta = -\ln(1-0.06667)$
$\boxed{d^{12} = 6.8798\%}$	$\boxed{i^{(2)} = 7.02003\%}$	$\delta = 6.8996\%.$

Ques (7)

1) $i^4 = ?$

$$26000 = 20{,}000 \times \left(1+\frac{i^4}{4}\right)^{\cancel{4} \times \frac{17}{\cancel{12}\,3}}$$

$$(1.3)^{\frac{3}{17}} = \left(1+\frac{i^4}{4}\right)$$

$$\boxed{i^4 = 18.95525\%}$$

(ii)

$$\frac{26000}{20000} = \left(1-\frac{d^2}{2}\right)^{-\cancel{2} \times \frac{17}{\cancel{12}\,6}}$$

$$(1.3)^{-\frac{6}{17}} = \left(1-\frac{d^2}{2}\right)$$

$$\boxed{d^2 = 17.68823}\ \%$$

(iii)

$$\frac{26000}{20000} = \left(1+\frac{17}{12}i\right).$$

$$1.3 - 1 = \frac{17}{12}i$$

$$\boxed{i = 21.17647\%}$$

Page No.
Date : / /20

Ques (a)

(i) force of interest :-> It refers to nomial interest rate or a discount rate compounded infinite number of times per time period.

(ii) 1) $i^{2} = 0.0775$

$$\left(1+\frac{i^{2}}{2}\right)^{2} = 1+i$$

$$\left[1+\frac{0.0775}{2}\right]^{2} = 1+i$$

$$\boxed{i = 7.9001563\%}$$

2) $\ln(1+i) = \delta$

$$\boxed{7.6036134\%}$$

3) $$(1+i) = \left(1-\frac{d^{12}}{12}\right)^{-12}$$

$$(1+i)^{\frac{-1}{12}} = 1-\frac{d^{12}}{12}$$

$$\boxed{d^{12} = 7.57957\%}$$

4) $i^{(1/2)}$ $\Rightarrow$ $$\left(1+\frac{i^{1/2}}{1/2}\right)^{1/2} = 1+i$$

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

$$\boxed{i^{(1/2)} = 8.2122186\%}$$

Date : / /20

Ques (10) ~~when 0 t ≤ 5~~ when $0<t<5$

$$v(t) = e^{-\int_0^t (0.08)\,ds}$$

$$\Rightarrow e^{-[0.08s]_0^t}$$

$$\Rightarrow \boxed{e^{-0.08t} = v(t)}$$

when $5 \le t \le 10$.

$$v(t) = e^{-\int_0^5 0.08\,ds} \times e^{-\int_5^t (0.06)\,ds}$$

$$\Rightarrow e^{-0.08(5)} \times e^{-[0.06t]_5^t}$$

$$\Rightarrow e^{-0.4} \times e^{-[0.06t-0.3]}$$

$$\Rightarrow e^{-0.4+0.3-0.06t} \Rightarrow \boxed{e^{-0.1-0.06t} = v(t)}$$

when $t \ge 10$

$$v(t) = e^{-\cancel{0.08(5)}} \cancel{\times e}$$

$$v(t) = e^{-0.1-0.06(10)} \times e^{-\int_{10}^t (0.04)\,ds}$$

$$\Rightarrow e^{-0.1-0.6} \times e^{-[0.04s]_{10}^t}$$

$$\Rightarrow e^{-0.1-0.6} \times e^{-0.04t+0.4}$$

$$\boxed{v(t) \Rightarrow e^{-0.3-0.04t}} \quad \text{—— (11)}$$

Ques (1)

a) $d = 18\%$

$t = \frac{9}{12}$

$PV = \text{Amt. due} \times (1-d)^{9/12}$

$50{,}000 \times (1-0.18)^{9/12}$

$\boxed{PV = 43085.42623}$

b) (i) $\delta = 6\%$, d^{12}

$e^{-\frac{0.06}{12}} = \left(1 - \frac{d^{12}}{12}\right)$

$\boxed{d^{12} \Rightarrow 5.98850250\%}$

(ii) $d^4 = 6\%$ $i^{12} = ?$

$\left(1 - \frac{d^4}{4}\right)^{-4} = \left(1 + \frac{i^{12}}{12}\right)^{12}$

$\cancel{1-d}\left(1 - \frac{0.06}{4}\right)^{\frac{-4}{12}} = 1 + \frac{i^{12}}{12}$

$\boxed{i^{12} = 6.0607089\%}$

c) $\cancel{\boxed{d < \delta < i^{(4)}}}$ $\boxed{d < \delta < i^{(4)} < i}$

d) Already done :-)

Ques (12)

$$AV_6 = 7049 \times \left(1+\frac{i^{12}}{12}\right)^{24} \times \left[1+10\times 0.015\right] \times \left[1-\frac{d^{12}}{12}\right]^{-18}$$

$$\Rightarrow 7049 \times \left[1+\frac{0.06}{12}\right]^{24} \times \left[1+10\times 0.015\right] + \left[1-\frac{0.06}{12}\right]^{-18}$$

$$\Rightarrow 7049 \times \overset{1.127159978}{\cancel{1.2624777}} \times [1.15] \times 1.09442123$$

$$\boxed{AV_6 = 9999.883762}$$

(13) (i)

$$2x = x \times (1+i)^t$$

$$2 = [1+0.1]^t$$

$$\log 2 = t \log[1.1]$$

$$t = \frac{\log 2}{\log 1.1} = \begin{array}{l} 7.272541 \text{ years.} \\ \cancel{3.0437766} \\ \cancel{2.00833} \end{array}$$

(ii)

$$2 = \cancel{1\varnothing} \left(1-\frac{d^{12}}{12}\right)^{-12t}$$

$$2 = \left(1-\frac{0.1}{12}\right)^{-12t}$$

$$\ln 2 = -12t \ln\left(1-\frac{0.1}{12}\right)$$

$$\boxed{t = 6.90255}$$