1]

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

$d^4 = 8\%$

$\frac{d^4}{4} = 2\%$ ← Given

$$d = 1 - (1 - 0.02)^4$$

$$d = 7.763184\ \%$$

$$i = \frac{d}{1-d} = 8.4165\ \%$$

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

$\Rightarrow 8.0810\ \%$

ii) $i = 8.4165\%$

iii) $d^{12} = ?$ $\quad d = 1 - \left(1 - \frac{d^p}{p}\right)^p$

$$0.07763184 = 1 - \left(1 - \frac{d^{12}}{12}\right)^{12}$$

$$\left(1 - \frac{d^{12}}{12}\right)^{12} = 1 - 0.07763184$$

$$1 - \frac{d^{12}}{12} = \sqrt[12]{\quad}$$

$= 8.0539339$ ✓

05 JUNE • SATURDAY

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

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

$1000\, e^{-[0.004t^2/2 + 0.0002t^3/3]_0^{10}}$

$1000.\, e^{-[0.004(50) + 0.0002 \times \frac{1000}{3} - 0]}$

$1000.\, e^{-[0.2 + 0.06666]}$

$1000\, e^{[-0.26666]}$

$\Rightarrow 765.9334446$

ii) $PV_2 = 1000\, v(0,10)$

$765.9334446 = 1000.\, v(0,10)$

$v(0,10) = \frac{765.9334446}{1000}$

$\frac{1}{(1+i)^{10}} = 0.765933444$

$(1+i)^{10} = 1.30559647$

$i = 0.027024719$

06 SUNDAY

2021

3. i) Discounting 'i' from the discounting factor 'v', we obtain d.

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

ii) $d^2 = ?$

$$\frac{d^4}{4} = 2.25\%$$

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

$$= 1 - (1 - 0.0225)^4$$

$$d = 0.087007806$$

$$d^2 = 2\left[1 - (1 - 0.087007806)^{1/2}\right]$$

$$d^2 = 0.088987499$$

03 JUNE • THURSDAY

MAY 2021
S M T W T F S
30 31
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29

4. i) $d = iv$

ii) $i = 0.08$ $\quad d = \frac{i}{1+i} = 0.\overline{740}$

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

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

$$\frac{1-d^{12}}{12} = \sqrt[12]{1-d}$$

$$1 - \sqrt[12]{1-d} = \frac{d^{12}}{12}$$

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

$$d^{12} = 0.076714477$$

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

$$i^{365} = 365\left[(1+i)^{1/365} - 1\right]$$

$i^{365} \Rightarrow 0.076969155$

2021

c) $\delta = \log(1+i)$

$\delta = \log(1+0.08)$

$= 0.076961041 = 7.6961041\%$

d) $i^{(0.5)} = 0.5\left[(1+0.08)^{1/0.05} - 1\right]$

$= 8.32\%$

08 JUNE • TUESDAY

MAY 2021

S	M	T	W	T	F	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

5. i) $d^4 = 6\%$

a) $i^2 = ?$

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

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

$$d = 5.866344904\%$$

$$i = \frac{d}{1-d} = \frac{0.05866344904}{1-0.05866344904} = 6.231933604\%$$

$$i^2 = 2\left[(1+0.06231933604)^{1/2} - 1\right]$$

$$i^2 \Rightarrow 6.137753504\%$$

b) $d^{12} = 12\left[1 - (1-0.05866344904)^{1/12}\right]$

$= 0.060302524$

$\Rightarrow 6.030252404\%$

2021

He who does not understand your silence will probably not understand your words — Elbert Hubbard

9 $20000 . AV(0,1) = 220000$

$AV(0,1) = 1.1$

10 $(1+i)^n = 1.1$

$i = 0.1$

11 a) $2,00,000 \times (1.01)^{9/365} = ₹. 204916.3564$

12

1

2

3

4

5

6

10 JUNE • THURSDAY

MAY 2021

S	M	T	W	T	F	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

7) $20{,}000 \cdot A(0,17) = 26000$

$A(0,17) = 1.3$

$(1+i)^{17/12} = 1.3$

i) $i = 20.345706\%$

ii) $i^4 = 4\left[(1+0.020345706)^{1/4} - 1\right]$
$= 18.9552545\%$

iii) $d^2 = ?$

$d = \frac{i}{1+i} = 0.16906051$

$d^2 = P\left[1 - \left(1 - \frac{d^P}{P}\right)^P\right] = 2\left(1 - (1-0.16906051)^{1/2}\right)$

$d^2 = 0.176882351$

iii) $i = 20.3457067\%$

iv) $i > i^4 > d^2 > d$

Ex. 9.1) Force of interest is interest earned during a very short period. It is not possible in real life

ii) $i^2 = 0.0775$

$$i = \left(1 + \frac{0.0775}{2}\right)^2 - 1$$

$i = 7.9001562\%$

$\delta = \log(1+i) = 7.6036133\%$

$d^{12} = ?$

$$d = \frac{i}{1+i} = 0.073217282$$

$$d^{12} = 12\left[1 - (1 - 0.073217282)^{1/2}\right]$$

$= 7.5795745\%$

$i^{1/2} = 1/2\left[(1 + 0.079001562)^2 - 1\right]$

$= 8.2122185\%$

12 JUNE • SATURDAY

2021

S	M	T	W	T	F	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

11.

a) $PV\,(1+0.18)^{3/4} = 50000$

$PV = \frac{50000}{(1.18)^{3/4}} = \frac{50000}{1.132169642}$

$P_0V_0 = 44162.99302$

b) i) $d = 6\%$

$d = 1 - e^{-d}$

$d = 0.058235466$

$d^{12} = 12[1-(1-0.058235466)^{1/12}]$

$= 5.985025\%$

ii) $d^4 = 6\%$

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

$d = 0.058663449 \quad i = \frac{d}{[-d} = 0.062319314$

$i^{12} = 12[(1+0.062319314)^{1/12}-1]$

$= 6.006069\%$

c) $i > d^{12} > d$