

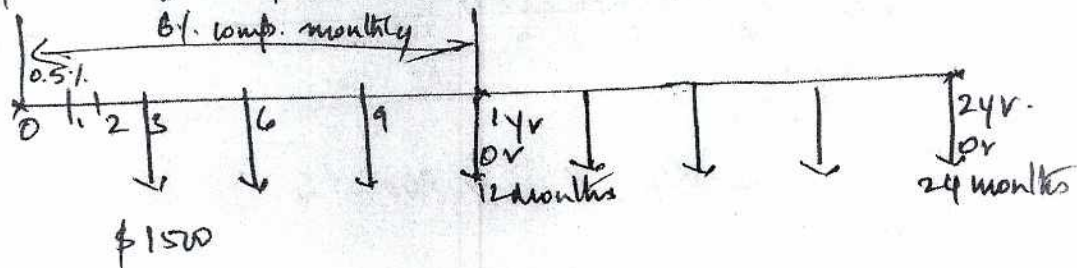


# MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

A Constituent Institution of Manipal University

## Nominal & Effective interest Rate

19. Deposit  $\rightarrow$  quarterly (P.P) C.P  $\rightarrow$  monthly



C.P  $\rightarrow$  Monthly

P.P  $\rightarrow$  C.P

P.P  $\rightarrow$  quarterly

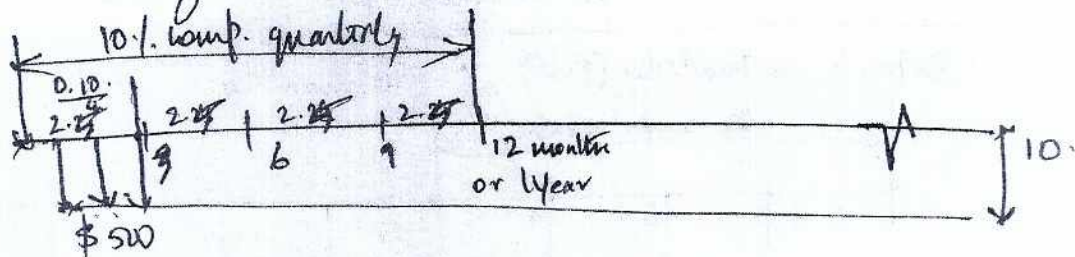
use  $i_{eff}$ .

$$i_{eff} = \left(1 + \frac{0.06}{12}\right)^{12} - 1 = 1.5\% \text{ or } 0.015075$$

$$\begin{aligned} F_{@24} &= A [F/A, i_{eff}, n] \\ &= 1500 \left[ \frac{1 + 0.015}{0.015} - 1 \right] \\ &= \underline{\underline{12,649.}} \end{aligned}$$

20 Deposit = \$500 <sup>every month</sup> for 10 yr.

Compounding period = 10% compounded quarterly.

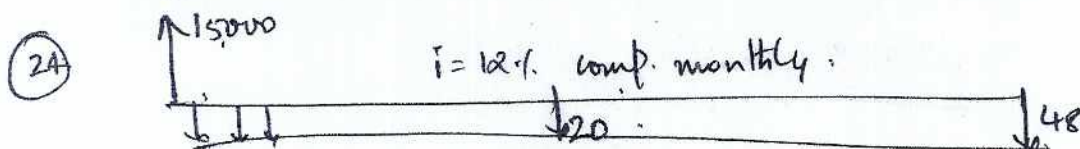


P.P → monthly C.P → quarterly.

C.P > P.P.

$$i_{eff} = \left(1 + \frac{0.10}{4}\right)^4 - 1 = \underline{\underline{0.008256}}$$

$$\begin{aligned} F &= A [F/A, i_{eff}, n] \\ &= 500 \left[ \frac{(1 + 0.008256)^{120} - 1}{0.008256} \right] \\ &= \underline{\underline{101890.32}} \end{aligned}$$



$$i = \frac{r}{m} = \frac{0.12}{12} \quad \text{OR} \quad i_{eff} = \left(1 + \frac{0.12}{12}\right)^{12} - 1 = \underline{\underline{1\%}}$$

$$\begin{aligned} A &= 15000 (A/P, 1\%, 48) \\ &= \underline{\underline{395}} \end{aligned}$$

$$P_{20} = 395 (P/A, 1\%, 28) = 9605$$

OR

$$F_{48} = 395 (F/A, 1\%, 48) = \underline{\underline{\quad\quad\quad}} \quad P_{20} = F_{48} (P/F, 1\%, 28) = \underline{\underline{\quad\quad\quad}}$$

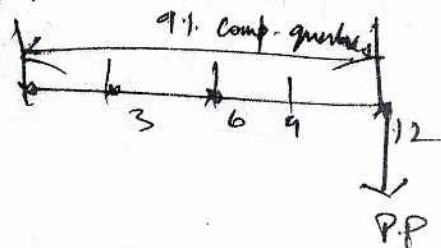
When the payments are on an annual basis.

Bid 1: 9% per year compounded quarterly.

P.P.  $\rightarrow$  12 months, C.P.  $\rightarrow$  quarterly,

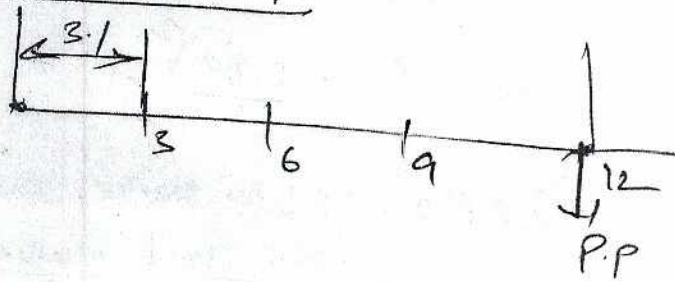
P.P.  $\times$  C.P.

$$i_{\text{eff}} = \left(1 + \frac{0.09}{4}\right)^4 - 1 = \underline{\underline{9.3\%}}$$



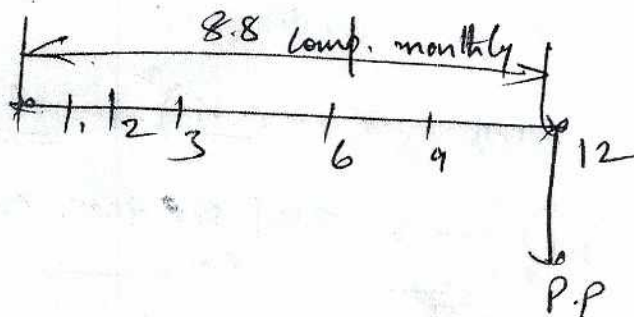
Bid 2: 3% per quarter, comp. quarterly

$$i_{\text{eff}} = (1 + 0.03)^4 - 1$$
$$= 12.5\%$$



Bid 3: 8.8% per year, compounded monthly

$$i_{\text{eff}} = \left(1 + \frac{0.088}{12}\right)^{12} - 1$$
$$= \underline{\underline{9.1\%}}$$



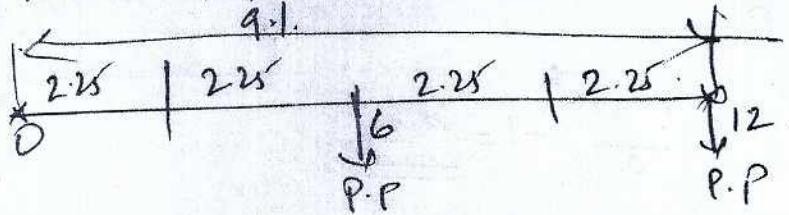




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When payments are on semiannual basis.  
29. i) Bid 1: 9% per year compounded quarterly.



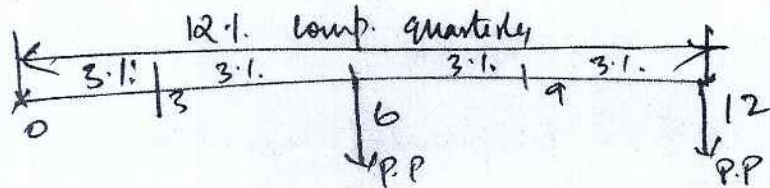
P.P - semiannual

P.P > C.P

C.P - quarterly

$$i_{eff} = \left(1 + \frac{0.09}{4}\right)^2 - 1 = \underline{\underline{4.5\%}}$$

ii) Bid 2: 3% per quarter, comp. quarterly



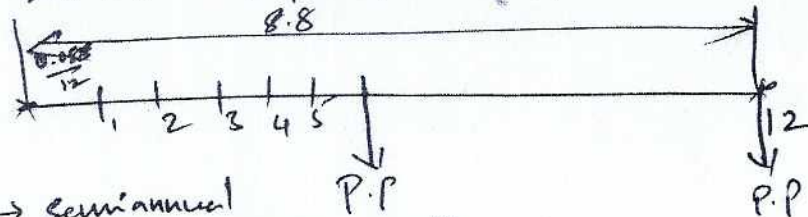
P.P → semiannual

P.P > C.P

C.P → quarterly

$$i_{eff} = \left(1 + \frac{0.12}{4}\right)^2 - 1 = \underline{\underline{6.09\%}}$$

iii) Bid 3: 8.8% per year, compounded monthly



P.P → semiannual

P.P

C.P → monthly

P.P > C.P

$$i_{eff} = \left(1 + \frac{0.088}{12}\right)^6 - 1 = \underline{\underline{4.48\%}}$$



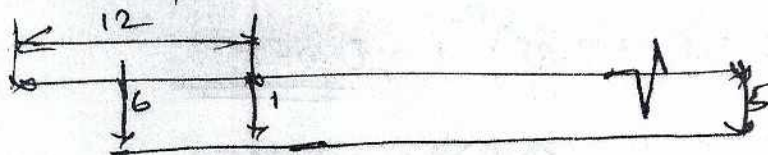
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30 i) if int. is 12% comp. semiannually.

P.P → 6mo. every 6 months

C.P → semiannually



$$i = \frac{r}{m} \text{ or } (1 + \frac{r}{m})^n - 1 \quad \text{6mo.}$$

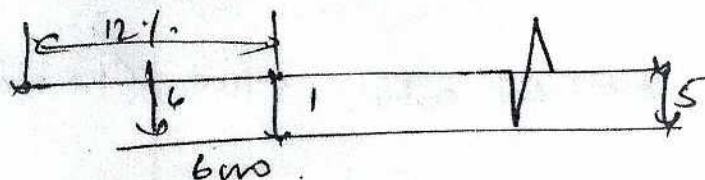
$$= \frac{0.12}{2} = 6\%$$

$$F = 600 \left( \frac{(1 + 0.06)^{10} - 1}{0.06} \right) = \underline{\underline{79086}}$$

ii) if int. is 12% compounded annually

P.P → 6 months

C.P → 12 months



$$i_{\text{eff}} = \left( 1 + \frac{0.12}{1} \right)^{1/2} - 1 = \underline{\underline{0.0583}}$$

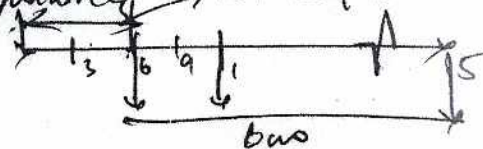
$$F = 600 \left( \frac{(1 + 0.0583)^{10} - 1}{0.0583} \right)$$

$$= \underline{\underline{78456}}$$

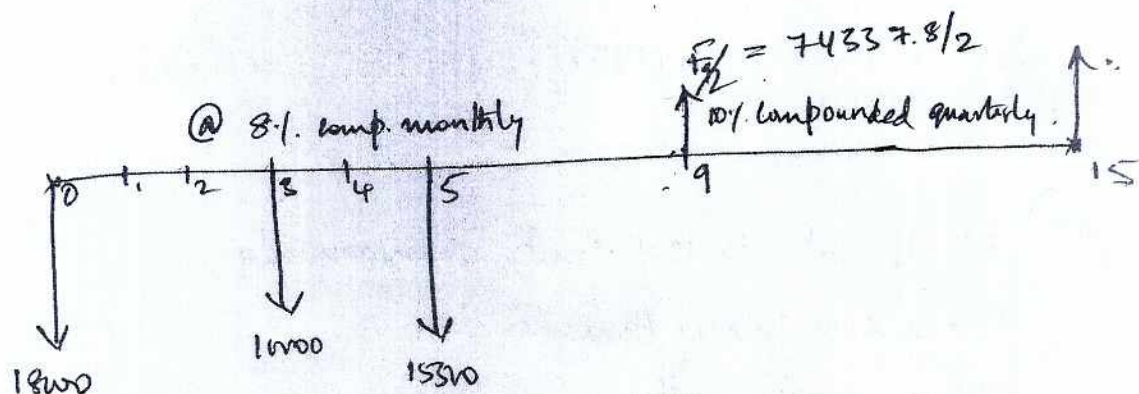
iii) if int. is 12% compounded quarterly

$$i_{\text{eff}} = \left( 1 + \frac{0.12}{4} \right)^4 - 1 = 6.09\%$$

$$F = 600 \left( \frac{(1 + 0.0609)^{10} - 1}{0.0609} \right) = \underline{\underline{79419}}$$



(31)



$$i_{eff} = \left(1 + \frac{0.08}{12}\right)^{12} - 1 = \underline{\underline{0.08299}}$$

$$i_{eff} = \left(1 + \frac{0.10}{4}\right)^4 - 1 = \underline{\underline{0.1038}}$$

$$F_9 = 18000 \left(1 + \frac{0.08299}{2.049}\right)^9 + 10000 \left(1 + \frac{0.08299}{1.6134}\right)^6 + 15300 \left(1 + \frac{0.08299}{1.3756}\right)^4$$

$$= \underline{\underline{74337.8}}$$

$$\frac{F_9}{2} = 37168.9$$

$$F_{15} @ 8\% \text{ comp. monthly} = 37168.9 (1 + 0.08299)^6 = \underline{\underline{59,968.94}}$$

$$F_{15} @ 10\% \text{ comp. quarterly} = 37168.9 (1 + 0.1038)^6 = \underline{\underline{67225.64}}$$