Ex 5.3

Q1 36 instalments of 20 @ 0.5% per month $= 0.005$

$$F = 20(1.005) + 20(1.005)^2 + \cdots 20(1.005)^{36}$$

$$S_n = \frac{a(1-r^n)}{1-r} \qquad a = 20(1.005), \quad r = 1.005, \quad n = 36$$

$$= \frac{20(1.005)\left[1-(1.005)^{36}\right]}{1-1.005}$$

$$= €790.66$$

Total Interest: $36 \times 20 = 720$

$$\Rightarrow \text{Int} = 790.66 - 720 = €70.66$$

Q2 €30 per month $18^{th} \rightarrow 21^{st} = 36$ months.

4% Per annum $= 0.04$.

(i) Monthly rate: $(1+r)^{12} = 1.04$

$r = (1.04)^{\frac{1}{12}} - 1 = 0.0033$

rate $= 0.33\%$

(ii) Value after 36 months (21^{st} Birthday)

$$F = 30(1.0033) + 30(1.0033)^2 + \cdots + 30(1.0033)^{36}$$

$$S_n = \frac{a(1-r^n)}{1-r^n}$$

$a = 30(1.0033)$

$r = 1.0033$

$n = 36$

$$= \frac{30(1.0033)\left[1-(1.0033)^{36}\right]}{1-1.0033}$$

$= €1148.55$

Q3 AER of 4% = 0.04

2000 per yr $n = 5$

$$F = 2000(1.04) + 2000(1.04)^2 + 2000(1.04)^3 + 2000(1.04)^4 + 2000(1.04)^5$$
$$= 11265.95$$

$$S_n = \frac{a(1-r^n)}{1-r}$$

$a = 2000(1.04)$

$r = 1.04$

$n = 5$

$$S_n = \frac{2000(1.04)[1-(1.04)^5]}{1-1.04}$$

$= €11265.95$

Q6

after 5 yrs €6523.33 9% = 0.09

(i) $6523.33 = A(1.09) + A(1.09)^2 + A(1.09)^3 + A(1.09)^4 + A(1.09)^5$

(ii) $$6523.33 = \frac{A(1.09)[1-1.09^5]}{1-1.09}$$

$a = A(1.09)$

$r = 1.09$

$n = 5$

$6523.33 = A(6.5233)$

$999.99 = A$

$1000 = A.$

Q7 200 each Month for 2 yrs ⇒ 24 months

9% = 0.09 per annum

find monthly rate!

$$(1+r)^{12} = 1.09$$

$$r = 1.09^{\frac{1}{12}} - 1$$

$$r = 0.007207 3$$

$$F = 200(1.0072) + 200(1.0072)^2 + 200(1.0072)^2 - - -$$
$$\cdots + 200(1.0072)^{24}$$

$$S_n = \frac{a(1-r^n)}{1-r} \qquad a = 200(1.0072)$$
$$r = 1.0072$$
$$n = 24$$

$$= \frac{200(1.0072)\left[1 - (1.0072)^{24}\right]}{1 - 1.0072}$$

$$= €5256.82$$

Q8 $8.5\% = 0.085$. $t = 7$ yrs

$FV = 10,000$

$$10,000 = P(1.085) + P(1.085)^2 + \cdots P(1.085)^7$$

$a = P(1.085)$

$r = 1.085$

$n = 7$

$$10000 = \frac{P(1.085)\left[1-(1.085)^7\right]}{1-1.085}$$

$$10000 = P(9.8306\ldots)$$

$$€1017.23 = P$$

Q9 $FV = 5000$ $t = 3$ yrs 7.2% per annum $= 0.072$

$= 3 \times 4 = 12$ quotes.

compounded quartly $\Rightarrow$ find quartly rate.

$$(1+r)^4 = 1.072$$

$$r = 1.072^{1/4} - 1$$

$$r = 0.01753$$

$$5000 = P(1.01753) + P(1.01753)^2 + \cdots P(1.01753)^{12}$$

$a = P(1.01753)$

$r = 1.01753$

$n = 12$

$$5000 = \frac{P(1.01753)\left[1-(1.01753)^{12}\right]}{1-1.01753}$$

$$5000 = P(13.4592\ldots)$$

$$€371.49 = P$$

(4) Q11 €3000 per yr / 6 yrs / 8% = 0·08.

$$P = 3000 + \frac{3000}{1.08} + \frac{3000}{1.08^2} + \cdots \frac{3000}{1.08^6}$$

(i) $a = 3000$

$r = \frac{1}{1.08}$

$n = 6$

$$P = \frac{3000\left[1 - \left(\frac{1}{1.08}\right)^6\right]}{1 - \frac{1}{1.08}}$$

$= €14,978.13.$

(ii) $FV = 3000(1.08) + 3000(1.08)^2 + \cdots 3000(1.08)^6.$

$a = 3000(1.08)$

$r = 1.08$

$n = 6$

$S_n = \frac{a(1-r^n)}{1-r}$.

$$FV = \frac{3000(1.08)\left[1 - 1.08^6\right]}{1 - 1.08}$$

$= €23,768.41$

(iii) 14,978·13 at 8% = 0·08 for 6 yrs.

$F = 14978.13(1.08)^6$

$= €23768.41.$