

SAMPLE PAPER 5: PAPER 1

QUESTION 8 (50 MARKS)

Question 8 (a) (i)

First repayment: $\frac{A}{1.055}$, Second repayment: $\frac{A}{(1.055)^2}$, Third repayment: $\frac{A}{(1.055)^3}$

Question 8 (a) (ii)

$$P = \frac{A}{1.055} + \frac{A}{(1.055)^2} + \frac{A}{(1.055)^3} + \frac{A}{(1.055)^4} + \frac{A}{(1.055)^5} + \frac{A}{(1.055)^6}$$

Question 8 (a) (iii)

$$P = \frac{A}{1.055} + \frac{A}{(1.055)^2} + \frac{A}{(1.055)^3} + \frac{A}{(1.055)^4} + \frac{A}{(1.055)^5} + \frac{A}{(1.055)^6} \quad [\text{This is a geometric series.}]$$

$$a = \frac{A}{1.055}, r = \frac{1}{1.055}$$

$$S_6 = \frac{a(1-r^6)}{1-r} = \frac{\frac{A}{1.055} \left(1 - \frac{1}{1.055^6}\right)}{1 - \frac{1}{1.055}}$$

$$\therefore 15\,000 = \frac{\frac{A}{1.055} \left(1 - \frac{1}{1.055^6}\right)}{1 - \frac{1}{1.055}} \Rightarrow \frac{15\,000 \left(1 - \frac{1}{1.055}\right)}{\left(1 - \frac{1}{1.055^6}\right)} = \frac{A}{1.055}$$

$$\therefore A = \frac{1.055 \times 15\,000 \left(1 - \frac{1}{1.055}\right)}{\left(1 - \frac{1}{1.055^6}\right)} = \text{€}3002.68$$

Question 8 (b) (i)

$$P = \frac{A}{(1+i)^1} + \frac{A}{(1+i)^2} + \frac{A}{(1+i)^3} + \dots + \frac{A}{(1+i)^t}$$

Question 8 (b) (ii)

$$P = \frac{A}{(1+i)^1} + \frac{A}{(1+i)^2} + \frac{A}{(1+i)^3} + \dots + \frac{A}{(1+i)^t} \quad [\text{This is a geometric series.}]$$

$$a = \frac{A}{(1+i)}, r = \frac{1}{(1+i)}$$

$$S_t = P = \frac{a(1-r^t)}{1-r} = \frac{\frac{A}{(1+i)} \left(1 - \frac{1}{(1+i)^t}\right)}{1 - \frac{1}{(1+i)}} = \frac{A \left(\frac{(1+i)^t - 1}{(1+i)^t}\right)}{(1+i) \left(\frac{1+i-1}{(1+i)}\right)} = \frac{A \left(\frac{(1+i)^t - 1}{(1+i)^t}\right)}{i} = \frac{A((1+i)^t - 1)}{i(1+i)^t}$$

$$\therefore A = P \frac{i(1+i)^t}{((1+i)^t - 1)}$$

Question 8 (b) (iii)

$$\begin{aligned} A &= P \frac{i(1+i)^t}{((1+i)^t - 1)} \\ &= 15\,000 \times \frac{0.055(1.055)^6}{(1.055^6 - 1)} = \text{€}3002.68 \end{aligned}$$

Question 8 (c) (i)

$$\begin{aligned} (1.055)^{\frac{1}{12}} &= 1.0044717 = 1+i \\ i &= 0.0044717 = 0.44717\% \end{aligned}$$

Question 8 (c) (ii)

$$\begin{aligned} A &= P \frac{i(1+i)^t}{((1+i)^t - 1)} \\ &= 15\,000 \times \frac{0.0044717(1.0044717)^{72}}{(1.0044717^{72} - 1)} = \text{€}244.13 \end{aligned}$$

Question 8 (c) (iii)

$$\text{€}3002.68 \times 6 - \text{€}244.13 \times 72 = \text{€}438.72$$
