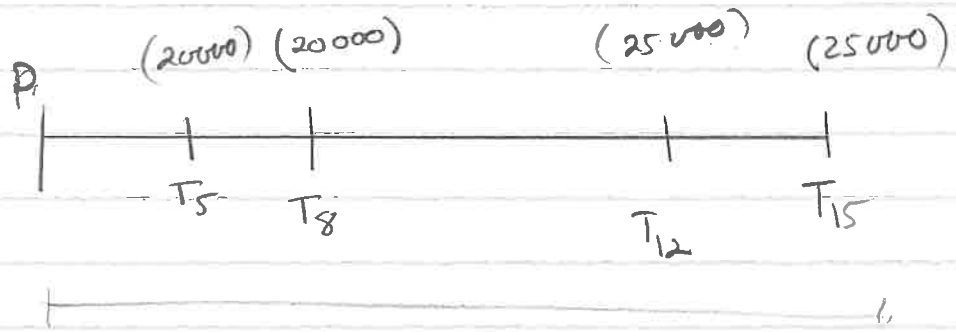
Prelims P2 APM 2019

Q1

a.1

(1)



12% p.a. c.q.

$A = 0$ $\quad i = \frac{12\%}{4}$ ✓

$$0 = P(1+i)^{15\times4} - 20000(1+i)^{10\times4} - 20\,000(1+i)^{7\times4} - 25\,000(1+i)^{3\times4} - 25\,000$$ ✓ ✓ ✓ ✓ ✓

$\therefore P = R29\,133{,}55$ ✓ 7

(2)

$$\left(1+\frac{12\%}{4}\right)^4 = 1+E$$ ✓ ✓

$E = 12{,}55\%$ ✓ 3

(b) $85\,000 = 120\,000(1-i)^4$

$i = 0{,}0825$

$\approx 8{,}26\%$ p.a. 5

Q2

a.

(1) $A = 85\,000\left(1+\frac{10\%}{12}\right)^3$

$\approx 87\,142{,}76$

FORMULA

$P_v = 87\,142{,}76 = 2000\dfrac{\left(1-\left(1+\frac{10\%}{12}\right)^{-n}\right)}{\frac{10\%}{12}}$

$0{,}636905 = \left(1+\frac{10\%}{12}\right)^{-n}$

$\log_{\left(1+\frac{10\%}{12}\right)} 0{,}636905 = -n$

$-n \doteq -54{,}36$

$\therefore n = 54{,}36$

55 payments

9.

a

(2)

$$87142{,}76 = 2000\frac{\left(1-\left(1+\frac{10\%}{12}\right)^{-54}\right)}{\frac{10\%}{12}} + y\left(1+\frac{10\%}{12}\right)^{-55}$$

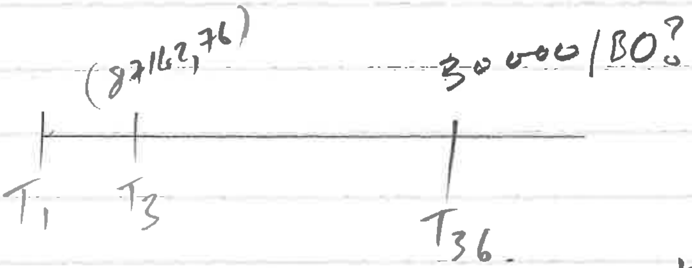
FORMULA FORMULA

$$459{,}13 = y\left(1+\frac{10\%}{12}\right)^{-55}$$

$$\therefore\ y = R\,724{,}71$$ 8

b

(1)



$$87142{,}76\left(1+\frac{10\%}{12}\right)^{33} = 2000\frac{\left(\left(1+\frac{10\%}{12}\right)^{33}-1\right)}{\frac{10\%}{12}} + 80$$

F F

$$80 = R\,38987{,}94$$ 8

$\therefore$ 80 when R30 000

$= R\,8987{,}94.$

(2)

$$9000 = x\frac{\left(1-\left(1+\frac{10\%}{12}\right)^{-19}\right)}{10\%/12}$$ FORMULA

$$x = R514{,}14$$ 5

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Q3

a) $u_6 = 0,8u_5 + au_4$ ✓

$= 0,8(-1,44) + a(0,7)$ ✓

$u_6 = -1,152 + 0,7a$ ✓

$u_7 = 0,8u_6 + au_5$ ✓

$-0,4816 = 0,8(-1,152 + 0,7a) + a(-1,44)$ ✓

$-0,4816 = -0,9216 + 0,56a - 1,44a$ ✓

$0,44 = -0,88a$ ✓

$a = -0,5$ ✓

8

(b)

(1) 78c ow ✓ 1

(2) 14 ✓✓ 2

(3) $T_5 = 366934$ ✓✓ 2

13

Q4

a. $c = \frac{1}{\text{Average lifespan}}$ ✓

$0,2 = \frac{1}{\bar{A}}$ ✓

$\therefore \bar{A} = 5$ years. ✓ 3

b. $0,\cancel{0}08$ ✓ 1

c. $f \times b = 0,000135$

$f \times 0,008 = 0,000135$ ✓

$\therefore f = 0,016875$ ✓ 2

$= 27/16000$

d. 1500 Rabbits ✓

14 Foxes ✓ 2

e. $\simeq 1450$ rabbits ✓

$\simeq 7$ Foxes ✓ 2

f. ✓F ✓subst

$F^* = F^* + 0,000135 R^* F^* - 0,2 F^*$

✓ ✓

$\therefore R^* = 1481,48 \simeq 1482$

✓F ✓subst

$R^* = R^* + 0,73 R^* \left(1 - \frac{R^*}{5000}\right) - 0,08 R^* F^*$ 9

✓ ✓ Via

$\therefore F^* = 6,42 \simeq 7$

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Q5

a.) A 4

B 0,242424

C 4,05

D. 0,0599105 4

b) $\frac{\Delta P}{P} = -0{,}0105\, P + 0{,}3991$ 5

c r : Intrinsic growth rate / K : Carrying capacity 2

d. $r = 0{,}3991$ Intrinsic growth rate.

$-\frac{r}{K} = -0{,}0105$

$\therefore K = 38{,}009$ Carrying Capacity. 6

$$P_{n+1} = P_n + rP_n\left(1 - \frac{P_n}{K}\right)$$ F

$$P_{n+1} = P_n + 0{,}3991 P_n\left(1 - \frac{P_n}{38{,}009}\right)$$ subst

e) $\rho = 0{,}911$ correlation coefficient, shows a very high correlation

$P_7 = 33{,}56$ as to $T_7 = 31{,}7$ 4

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