

**QUESTION FIVE:**

- 5.1. Calculate the effective annual rate of interest if the nominal rate is 7 % per annum compounded monthly. (4)
- 5.2. A laptop costing R12 000 is purchased. Determine the book value of the laptop 3 years later if depreciation is calculated at 15 % p.a. according to the straight line method. (3)

*p.t.o. Question 5.3...*

- 5.3. R 200 000 is invested for a period of 4 years at an interest rate of 6.5 % p.a. compounded monthly for the first 2 years. After the second year R10 000 is added to the account and interest changes to 8 % p.a. compounded quarterly for the next two years. Calculate the value of the investment at the end of 4 years. (5)

**QUESTION 7**

On 1 June 2016 a bank granted Thabiso a loan of R250 000 at an interest rate of 15% p.a. compounded monthly, to buy a car. Thabiso agreed to repay the loan in monthly instalments commencing on 1 July 2016 and ending 4 years later on 1 June 2020. However, Thabiso was unable to make the first two instalments and only commenced with the monthly instalments on 1 September 2016.

- 7.1 Calculate the amount Thabiso owed the bank on 1 August 2016, a month before he paid his first monthly instalment. (2)
- 7.2 Having paid the first monthly instalment on 1 September 2016, Thabiso will still pay his last monthly instalment on 1 June 2020. Calculate his monthly instalment. (4)
- 7.3 If Thabiso paid R9 000 as his monthly instalment starting on 1 September 2016, how many months sooner will he repay the loan? (5)
- 7.4 If Thabiso paid R9 000 as a monthly instalment starting on 1 September 2016, calculate the final instalment to repay the loan. (4)

**[15]**

### QUESTION 7

- 7.1 A company bought machinery costing R80 000. Using the reducing balance method, the machinery had a book value of R20 000 after 5 years.
- Calculate the rate of depreciation. (3)
- 7.2 Calculate the effective interest rate if interest is compounded at 5% p.a., compounded quarterly. (3)
- 7.3 Sipho invested R30 000 for 6 years. The investment earned interest at 12% p.a., compounded monthly for the first two years. Thereafter the interest rate changed to 10,8% p.a., compounded semi-annually for the rest of the period.
- Calculate the value of the investment at the end of 6 years. (No other transactions were made on the account.) (4)
- 7.4 Mary deposited R25 000 into a savings account with an interest rate of 18% p.a., compounded monthly. Mary withdrew R8 000 from the account 2 years after depositing the initial amount. She deposited another R4 000 into this account  $3\frac{1}{2}$  years after the initial deposit. What amount will Mary have 5 years after making the initial deposit in this account? (6)
- [16]

# ANSWERS

QUESTION FIVE :

$$5.1. 1 + i = \left(1 + \frac{i^m}{m}\right)^m \checkmark^A$$

$$1 + i = \left(1 + \frac{7}{1200}\right)^{12} \checkmark^A$$

$$i = 7,23 \% \text{ p.a.} \checkmark^{CA}$$

$$5.2. A = P(1 - i)^n \checkmark^A$$

$$A = 12000 \left(1 - \frac{15}{100}(3)\right) \checkmark^A$$

$$A = R6600 \checkmark^{CA}$$

(3)

$$5.3. A_1 = P(1 + i)^n \checkmark^A$$

$$= 200\,000 \left(1 + \frac{6,5}{1200}\right)^{2 \times 12} \checkmark^A$$

$$= 227\,689,79 \checkmark^{CA}$$

$$A_2 = 227\,689,79 \left(1 + \frac{8}{400}\right)^{4 \times 2} \checkmark^{CA}$$

$$= R266\,770,19 \checkmark^{CA}$$

(5)

$$5.4. A = P(1 + i)^n$$

$$7125 = 6000(1 + i)^3 \checkmark^A$$

$$\frac{7125}{6000} \checkmark^{CA} = (1 + i)^3$$

$$\sqrt[3]{\frac{7125}{6000}} \checkmark^{CA} = 1 + i$$

$$i = \sqrt[3]{\frac{7125}{6000}} - 1 \checkmark^{CA}$$

$$i = 5,90 \% \text{ p.a.} \checkmark^{CA}$$

(5)

[17]

**QUESTION/VR44G 7**

7.1	$A = P(1+i)^n$ $= 250000 \left(1 + \frac{0,15}{12}\right)^2$ $= R256\,289,06$	<p>✓ substituting <math>i</math> and <math>n</math> values in correct formula</p> <p>✓ answer</p> <p>(2)</p>
7.2	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $256\,289,06 = \frac{x \left[1 - \left(1 + \frac{0,15}{12}\right)^{-46}\right]}{\frac{0,15}{12}}$ $3203,6133 = x \left[1 - \left(1 + \frac{0,15}{12}\right)^{-46}\right]$ $x = R\,7\,359,79 \text{ per month}$ <p><b>OR/OF</b></p> $250000 = \frac{x \left(1 + \frac{0,15}{12}\right)^{-2} \left[1 - \left(1 + \frac{0,15}{12}\right)^{-46}\right]}{\frac{0,15}{12}}$ $x = R\,7\,359,79$	<p>✓ <math>i = \frac{0,15}{12}</math></p> <p>✓ <math>n = 46</math></p> <p>✓ substitution into correct formula</p> <p>✓ answer</p> <p>(4)</p> <p>✓ <math>i = \frac{0,15}{12}</math></p> <p>✓ <math>n = 46</math></p> <p>✓ substitution into correct formula</p> <p>✓ answer</p> <p>(4)</p>

7.3	$256\,289,06 = \frac{9\,000 \left[ 1 - \left( 1 + \frac{0,15}{12} \right)^{-n} \right]}{\frac{0,15}{12}}$ $\left( 1 + \frac{0,15}{12} \right)^{-n} = 0,6440429722$ $-n \log \left( 1 + \frac{0,15}{12} \right) = \log 0,6440429722$ $n = 35,41872568 \text{ months/maande}$ $\therefore 36 \text{ payments are required}$ $\therefore 36 \text{ paalemente moet betaal word}$ $\therefore \text{Thabiso will pay his loan off 10 months sooner./Thabiso los sy lening 10 maande vroeër af.}$ <p><b>OR/OF</b></p>	<p>✓ <math>x = 9\,000</math></p> <p>✓ substitute into correct formula</p> <p>✓ use of logs</p> <p>✓ <math>n = 35,42</math></p> <p>✓ 10 months</p> <p>(5)</p>
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$256289,06 \left( 1 + \frac{0,15}{12} \right)^n = \frac{9000 \left[ \left( 1 + \frac{0,15}{12} \right)^n - 1 \right]}{\frac{0,15}{12}}$ $3203,61325 \left( 1 + \frac{0,15}{12} \right)^n = 9000 \left( 1 + \frac{0,15}{12} \right)^n - 9000$	<p>✓ 9 000</p> <p>✓ substitute into correct formula</p>
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	$9000 = 5796,38675 \left(1 + \frac{0,15}{12}\right)^n$ $n = \log_{\left(1 + \frac{0,15}{12}\right)} 1,5523691425$ $n = 35,41872568$ <p><math>\therefore</math> 36 payments are required</p> <p><math>\therefore</math> 36 <i>paalemente moet betaal word</i></p> <p><math>\therefore</math> Thabiso will pay his loan off 10 months sooner./Thabiso <i>los sy lening 10 maande vroeër af.</i></p>	<p>✓ use of logs</p> <p>✓ <math>n = 35,42</math></p> <p>✓ 10 months</p> <p>(5)</p>
7.4	<p>The balance of his loan after the 35<sup>th</sup> payment was made: <i>Die balans van sy lening nadat die 35<sup>ste</sup> paalement betaal is:</i></p> $\text{Balance} = 256289,06 \left(1 + \frac{0,15}{12}\right)^{35} - \frac{9000 \left[\left(1 + \frac{0,15}{12}\right)^{35} - 1\right]}{\frac{0,15}{12}}$ $= R\ 3\ 735,45$ <p>Final instalment = <math>3\ 735,45 \left(1 + \frac{0,15}{12}\right)</math></p> $= R\ 3\ 782,14$ <p><b>OR/OF</b></p> $P = \frac{x[1 - (1+i)^{-n}]}{i}$ <p>Final instalment</p> $= \frac{9\ 000 \left[1 - \left(1 + \frac{0,15}{12}\right)^{-0,41872568}\right]}{\frac{0,15}{12}} \left(1 + \frac{0,15}{12}\right)$	<p>✓ <math>256289,06 \left(1 + \frac{0,15}{12}\right)^{35}</math></p> <p>✓ <math>\frac{9000 \left[\left(1 + \frac{0,15}{12}\right)^{35} - 1\right]}{\frac{0,15}{12}}</math></p> <p>✓ <math>3\ 735,45 \left(1 + \frac{0,15}{12}\right)</math></p> <p>✓ answer</p> <p>(4)</p> <p>✓ 0,41872568</p> <p>✓ <math>\frac{9\ 000 \left[1 - \left(1 + \frac{0,15}{12}\right)^{-0,41872568}\right]}{\frac{0,15}{12}}</math></p> <p>✓ <math>\left(1 + \frac{0,15}{12}\right)</math></p>

$= \frac{L}{\frac{0,15}{12}} \left( 1 + \frac{0,15}{12} \right)^{36}$ $= R3\,782,14$	$\frac{0,15}{12}$ $\times \left( 1 + \frac{0,15}{12} \right)^{36}$ $\checkmark \text{ answer}$
OR/OF	(4)

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$\text{Balance} = 256289,06 \left( 1 + \frac{0,15}{12} \right)^{36} - \frac{9000 \left( \left( 1 + \frac{0,15}{12} \right)^{36} - 1 \right)}{\frac{0,15}{12}}$ $= R -5\,217,86$ $\text{Final payment} = 9\,000 - 5217,86$ $= R\,3\,782,14$	$\checkmark 256289,06 \left( 1 + \frac{0,15}{12} \right)^{36}$ $\checkmark \frac{9000 \left( \left( 1 + \frac{0,15}{12} \right)^{36} - 1 \right)}{\frac{0,15}{12}}$ $\checkmark 9\,000 - 5217,86$ $\checkmark \text{ answer}$
	(4)

7.1	$A = P(1-i)^n$ $20000 = 80000(1-i)^5$ $0,25 = (1-i)^5$ $\sqrt[5]{0,25} = 1-i$ $i = 1 - \sqrt[5]{0,25}$ $i = 0,24214417$ $i = 24,21\%$	<p>✓ substitution into correct formula/ verv.in korrekte vorm</p> <p>✓ simplification/vereenv</p> <p>✓ answer/antw.</p>	(3)
7.2	$1 + i_{\text{eff}} = \left(1 + \frac{i_{\text{nom}}}{m}\right)^m$ $1 + i_{\text{eff}} = \left(1 + \frac{0,05}{4}\right)^4$ $i_{\text{eff}} = 0,050945336...$ <p>Effective rate = 5,09 % p.a.</p>	<p>✓ vorm/vorm</p> <p>✓ subst/verv</p> <p>✓ answer/antw.</p>	(3)
7.3	$A = P(1+i)^n$ $= 30000 \left(1 + \frac{0,12}{12}\right)^{2 \times 12} \left(1 + \frac{0,108}{2}\right)^{4 \times 2}$ $= R 58\,017,51$ <p><b>OR/ OF</b></p> $A = P(1+i)^n$ $= 30000 \left(1 + \frac{0,12}{12}\right)^{2 \times 12}$ $= R 38092,04$ $A = 38092,04 \left(1 + \frac{0,108}{2}\right)^{4 \times 2}$ $= R 58\,017,51$	<p>✓ <math>30\,000 \left(1 + \frac{0,12}{12}\right)^{2 \times 12}</math></p> <p>✓ <math>\left(1 + \frac{0,12}{12}\right)^{2 \times 12}</math></p> <p>✓ <math>\left(1 + \frac{0,108}{2}\right)^{4 \times 2}</math></p> <p>✓ answer/antw.</p> <p>(4)</p> <p>✓ <math>30\,000 \left(1 + \frac{0,12}{12}\right)^{2 \times 12}</math></p> <p>✓ R 38092,04</p> <p>✓ <math>38092,04 \left(1 + \frac{0,108}{2}\right)^{4 \times 2}</math></p> <p>✓ answer/antw.</p> <p>(4)</p>	



<p>7.4</p>	$A = 25000\left(1 + \frac{0,18}{12}\right)^{5 \times 12} - 8000\left(1 + \frac{0,18}{12}\right)^{3 \times 12} + 4000\left(1 + \frac{0,18}{12}\right)^{1,5 \times 12}$ $= 25000\left(1 + \frac{0,18}{12}\right)^{60} - 8000\left(1 + \frac{0,18}{12}\right)^{36} + 4000\left(1 + \frac{0,18}{12}\right)^{18}$ $= R52636,74$ <p><b>OR/OF</b></p>	<p>✓ <math>\frac{0,18}{12}</math></p> <p>✓ <math>25000\left(1 + \frac{0,18}{12}\right)^{5 \times 12}</math></p> <p>✓ <math>-8000\left(1 + \frac{0,18}{12}\right)^{3 \times 12}</math></p> <p>✓ <math>+4000\left(1 + \frac{0,18}{12}\right)^{18}</math></p> <p>✓✓ answer/antw.</p>
	$A_1 = 25000\left(1 + \frac{0,18}{12}\right)^{2 \times 12}$ $= R35737,57$ <p>Amount in the account after the withdrawal:/Bedrag in rekening na onttrekking</p> $R35737,5703 - R8000$ $= R27737,5703$ <p>Amount in the account just before the deposit/bedrag in rekening voor die deposito</p> $A_2 = R27737,5703\left(1 + \frac{0,18}{12}\right)^{1,5 \times 12}$ $= R36262,45279$ <p>Amount in the account just after the deposit/Bedrag in rekening na onttrekking</p> $R36262,45279 + R4000$ $= R40262,45279$ <p>Amount in the account at the end of 5 years/Bedrag in rekening aan die einde van 5 jaar</p>	<p>✓ <math>\frac{0,18}{12}</math></p> <p>✓ <math>25000\left(1 + \frac{0,18}{12}\right)^{2 \times 12}</math></p> <p>✓ 27737,57</p> <p>✓ <math>27737,5703\left(1 + \frac{0,18}{12}\right)^{1,5 \times 12}</math></p> <p>✓ 40262,45</p>
	$= 40262,45279\left(1 + \frac{0,18}{12}\right)^{1,5 \times 12}$ $= R52636,74$	<p>✓ answer/antw.</p>