GRADE 12 EXAMINATION
NOVEMBER 2015

ADVANCED PROGRAMME MATHEMATICS
ELECTIVE MODULE: FINANCE AND MODELLING

MARKING GUIDELINES

Time: 1 hour 100 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

QUESTION 1

1.1 (a) A (2)
(b) D (2)
(c) B (2)

1.2 (a) R780 000 (1)
(b) 14% (2)
(c) R366 933,07 (2)
[11]

QUESTION 2

2.1 $$P_v = \frac{8\,645\left[1-\left(1+\frac{0,072}{12}\right)^{-180}\right]}{\frac{0,072}{12}}$$ ***P_v = R 949 951,21*** (5)

2.2 $8\,645 - 949\,951,21\left(\frac{0,072}{12}\right) =$ **2 945,29**

OR $949\,951,21\left(1+\frac{0,072}{12}\right)-8\,645 = 947\,005,92$

$949\,951,21 - 947\,005,92 = 2\,945,29$ (4)

2.3 $\left(1+\frac{0,072}{12}\right)^{12} = \left(1+\frac{i}{365}\right)^{365}$

$\frac{i}{365} = 0,000196\ldots$ ***i = 7,1792%*** (8)
[17]

QUESTION 3

3.1 $1\,200\,000 = \dfrac{x\left[1-\left(1+\dfrac{0,0624}{12}\right)^{-240}\right]}{\dfrac{0,0624}{12}}$ $x = 8\,764,15$

Annual = 8 764,15 × 3 × 12 = ***R315 509,24*** (8)

3.2 $OB = \dfrac{8\,764\left[1-\left(1+\dfrac{0,0624}{12}\right)^{-112}\right]}{\dfrac{0,0624}{12}} + 17\,000\left(1+\dfrac{0,0624}{12}\right)^{13}$

= 742 580,92 + 18 185,75 = ***R760 766,67***

OR

$$OB = 1\,200\,000\left(1+\frac{0,0624}{12}\right)^{128} - \frac{8\,764\left[\left(1+\frac{0,0624}{12}\right)^{128}-1\right]}{\frac{0,0624}{12}} + 17\,000\left(1+\frac{0,0624}{12}\right)^{13}$$

= ***R760 805,40*** (8)

3.3 $761\,000\left(1+\dfrac{0,0624}{12}\right)^{112} - \dfrac{9\,200\left(1+\dfrac{0,0624}{12}\right)\left[\left(1+\dfrac{0,0624}{12}\right)^{109}-1\right]}{\dfrac{0,0624}{12}}$

= 1 360 386,80 – 1 351 662,47 = ***8 724,32***

OR

$$761\,000\left(1+\frac{0,0624}{12}\right)^{111} - \frac{9\,200\left[\left(1+\frac{0,0624}{12}\right)^{109}-1\right]}{\frac{0,0624}{12}}$$

= 1 353 349,38 – 1 344 670,19 = 8 679,19

$8\,679,19\left(1+\dfrac{0,0624}{12}\right)$ = ***8 724,32***

OR

$$761\,000\left(1+\frac{0,0624}{12}\right)^{2} - \frac{9\,200\left[1-\left(1+\frac{0,0624}{12}\right)^{-109}\right]}{\frac{0,0624}{12}}$$

768 934,98 – 764 003,71 = 4 931,27

$4\,931,27\left(1+\dfrac{0,0624}{12}\right)^{110}$ = ***8 724,33*** (10)

[26]

QUESTION 4

4.1 (a) doubling happens at a constant rate every 35 years. (2)

(b) growth rate = birth – death
0,02 = birth – 1/56 **birth = 0,037 857 = 3,79%** (4)

4.2 (a) $A = \frac{0,054\ 571}{2,52} = \mathbf{0,021\ 655}$

$B = \frac{7,22 - 2,52}{2020 - 1950} = \mathbf{0,067\ 143}$

$C = \frac{0,067\ 143}{5,12} = \mathbf{0,013\ 114}$

$D = \frac{10,12 - 5,12}{2055 - 1985} = \mathbf{0,071\ 429}$

OR
D = 0,009 893 × 7,22 = **0,071 427** (8)

(b) On calculator, x = P and y = ΔP/P
regression modelling for y = A + Bx: A = 0,027 435 ≈ **2,74%** (4)

[18]

QUESTION 5

5.1 1 / 0,083 = **12 years** (2)

5.2 $\frac{b.f.L.W}{b.L.W} = \frac{0,000\ 000\ 169}{0,000\ 655} = \mathbf{0,000\ 258}$ (4)

5.3 0,345 = 1 × 1 × 0,6 × female **females = 57,5%** (4)

5.4 $W_{n+1} = W_n + 0,345.W_n\left(1 - \frac{W_n}{25\ 000}\right) - 0,000\ 655.W_n.L_n$ where $W_{n+1} = W_n$

$0,345.W_n\left(1 - \frac{W_n}{25\ 000}\right) = 0,000\ 655.W_n.L_n$

$L_n = \frac{0,345.\left(1 - \frac{5\ 500}{25\ 000}\right)}{0,000\ 655}$ **L_n = 410,8 ≈ 410 or 411** (8)

[18]

QUESTION 6

6.1 $T_2 = 1$ $T_3 = 2$ $T_4 = 3$ $T_5 = 5$ (6)

6.2 q = 0,8 < 1
| p | = 2 ⋪ 0,8 + 1 **not stable** (4)

[10]

Total 100 marks