INTERNATIONAL SECONDARY CERTIFICATE
EXEMPLAR 2021

FURTHER STUDIES MATHEMATICS (EXTENDED): PAPER II
MODULE III

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.

All alternative valid solutions will be credited accordingly.

FINANCE AND MODELLING

QUESTION 1

1.1 B ✓✓ (2)

1.2 C ✓✓✓ (3)

1.3 A ✓✓✓ (3)

1.4 B ✓✓✓✓ (4)

[12]

QUESTION 2

2.1 $920\,000 = ✓\ 1\,850\,000\,(1-i)^4$ ✓ $\therefore$ ***i* = 16,02%** ✓✓ (4)

2.2 $2\,680\,000 - 920\,000$ ✓ $= ✓\dfrac{x\left[\left(1+\dfrac{0,042}{12}\right)^{46}✓ - 1\right]✓\left(1+\dfrac{0,042}{12}\right)^{3}✓}{\dfrac{0,042}{12}✓}$

$\therefore$ ***x* = 34 961,87** ✓✓ (8)

[12]

QUESTION 3

3.1 $x + 1\,000$ ✓✓ $= x\left(1 + \frac{0,082}{4}✓\right)^4$ ✓ ***x* = 11 826,46** ✓✓ (6)

3.2 $2\,600(x + 0,025)$ ✓ $+ 1\,800(x)$ ✓ $= 274$ ✓✓

$4\,400x = 209$

$x = 0,0475$ ✓✓

***x* = 4,75% + 2,5%** ✓**= 7,25%** ✓ (8)

3.3 $10\,000\left(1 + \frac{0,072}{12}\right)^n$ ✓✓$=12\,000\left(1 + \frac{0,064}{12}\right)^n$ ✓✓

$\dfrac{5}{6} = \left(\dfrac{\frac{377}{375}}{\frac{503}{500}}\right)^n$ ✓✓

***n* = 275 months** ✓✓ (8)

[22]

QUESTION 4

4.1 Logistics ✓: carrying capacity present ✓ (2)

4.2 (a) S-shaped ✓✓ (b) Linear ✓✓ (4)

4.3 $0,65 \times 0,82$ ✓✓ $-\frac{1}{50}$ ✓ $=0,513$ ✓ (4)

4.4 $R_{n+1} = R_n + a.R_n\left(1-\frac{R_n}{40000}\right)$ ✓ $-4\ 000$ ✓ *with* $R_{n+1} = R_n$ ✓

$a.(18\ 000)$ ✓ $\left(1-\frac{18\ 000}{40\ 000}\right) = 4\ 000$ ✓✓ a = 0,404 ✓✓ (8)

4.5 $1 + 0,4 = (1 + a)^4$
✓✓

a = 0,087 757 per annum ✓✓

$R_{n+1} = R_n + 0,087.R_n\left(1-\frac{R_n}{40\ 000}\right)$ ✓ *with* $R_0 = 18\ 000$ ✓

R_6 = 23 235/6 ✓✓

OR

$1 + 0,4 = \left(1 + \frac{a}{4}\right)^4$ ✓✓

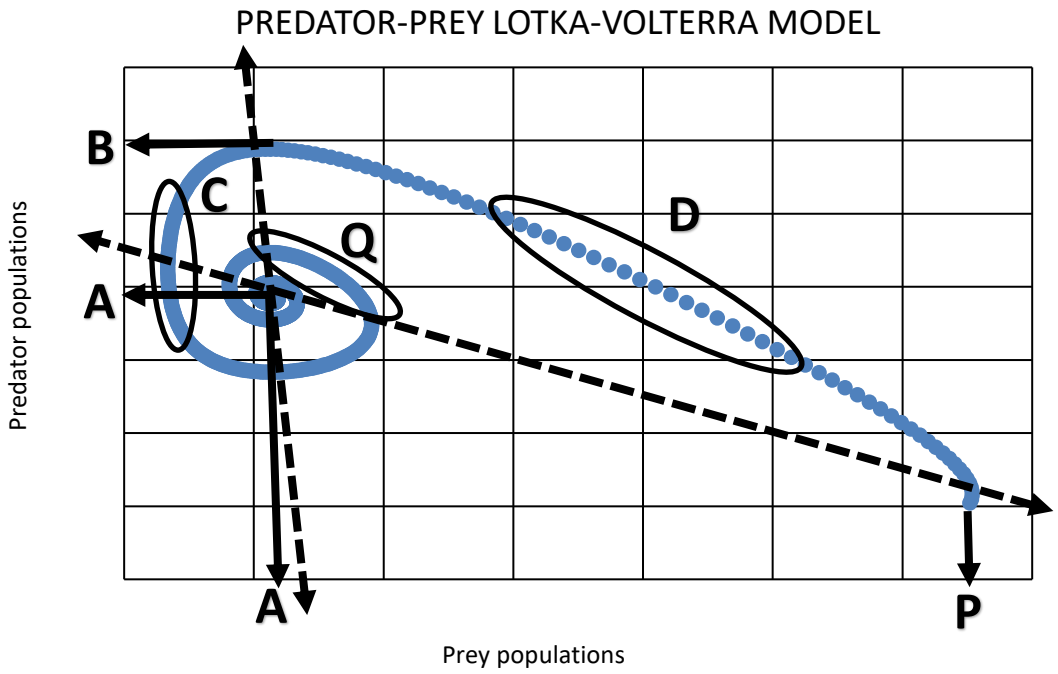
a = 0,351 092 four-yearly cycle, compounded per annum ✓✓

$R_{n+1} = R_n + \frac{0,351092}{4}.R_n\left(1-\frac{R_n}{40\ 000}\right)$ ✓ *with* $R_0 = 18\ 000$ ✓

R_6 = 23 235/6 ✓✓ (8)

[26]

QUESTION 5



5.1 (a) A ✓✓✓✓ (b) B ✓✓ (6)

5.2 (a) C ✓✓ (b) D ✓✓ (4)

5.3 pair of axes ✓
accuracy (passing through equilibrium pt)✓
accuracy (passing through max/min values of Prey) ✓
accuracy (passing through max/min values of Predator) ✓ (4)
[14]

QUESTION 6

6.1 $T_1 = 20\ 000\left(1+\frac{0{,}048}{12}\right)$ ✓ $+ 400 = 20\ 480$ ✓

$T_2 = 20\ 480\left(1+\frac{0{,}048}{12}\right)$ ✓ $+ 400(1{,}005)$ ✓ $= 20\ 963{,}92$ ✓

$T_3 = 20\ 963{,}92\left(1+\frac{0{,}048}{12}\right)$ ✓ $+ 400(1{,}005)^2$ ✓ $= 21\ 451{,}48$ ✓ (8)

6.2 T_n = ✓ 1,004. ✓ T_{n-1} + 400 ✓ (1,005) $\checkmark^{n-1}$, ✓ $T_0 = 20\ 000$ ✓ (6)
[14]

Total: 100 marks