Second Semester

Applied Mathematics

(الرياضيات التطبيقية)

(Answers)

Sultanate of Oman
Ministry of Education

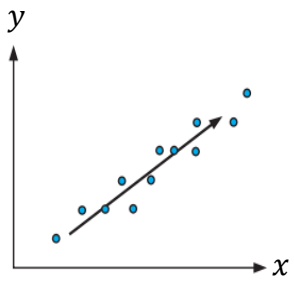
Diploma, Bilingual Private Schools, Applied Mathematics

Second Semester-First Session
Academic Year: 2022/2023

Answer Scheme

Answers Scheme
End of Year Exam 2022-2023: Second Semester/First Session
Applied Mathematics – Bilingual Private Schools

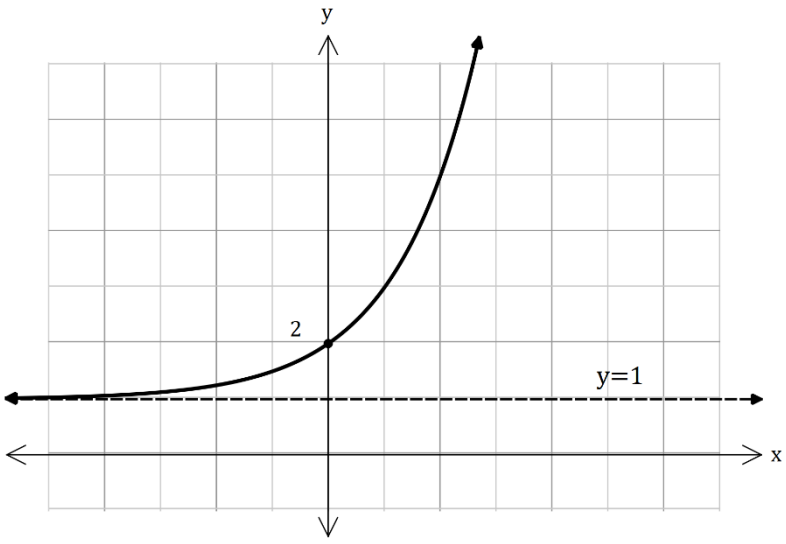
Question One: (Multiple choice) **[14 marks]**
Each item carries 1 mark

Item #	Answer	Taxonomy	Topic	Page
1	7	Knowledge	Exp. & Trig Functions	518
2	9	Knowledge	Exp. & Trig Functions	522
3	10	Application	Exp. & Trig Functions	530
4	-3	Reasoning	Exp. & Trig Functions	522
5	$f(x) = x^4 + x^3 + x$	Knowledge	More functions	554
6	2	Application	More functions	550
7	$y = x^3 - 3x^2 + 3x + 2$	Application	More functions	549
8		Knowledge	Two Variable Statistic	573
9	3	Application	Two Variable Statistic	593
10	2.71	Application	Two Variable Statistic	594-596
11	$15x^4$	Knowledge	Introductory Differential Calculus	611
12	$-1 \leq x \leq 2$	Application	Introductory Differential Calculus	622
13	4	Application	Introductory Differential Calculus	620
14	-12	Reasoning	Introductory Differential Calculus	626

Extended Response Questions

Item #	Answer	Marks	Taxonomy	Topic	Page
15	Since $y = 7\sin(5x) + 2$ a) Amplitude $\|A\| = 7$, then $A = 7$ b) Since $B = 5$, then the factor of horizontal dilation is $\frac{1}{B} = \frac{1}{5}$ c) Vertical translation units $C = 2$	***4marks*** 1 1 1 1	Knowledge	Exp. & Trig Functions	533 + 535

Item #	Answer	Marks	Taxonomy	Topic	Page
16		***4 marks***	Application	Exp. & Trig Functions	535
	$\text{period} = \frac{360^\circ}{B}$				
	$80^\circ = \frac{360^\circ}{4n}$	1			
	$4n = \frac{360^\circ}{80^\circ}$	1			
	$4n = \frac{9}{2}$	1			
	$n = \frac{9}{8}$	1			

Item #	Answer	Marks	Taxonomy	Topic	Page
17		***5 marks***	Application	Exp. & Trig Functions	519 + 520 + 522
	x | -1 | 0 | 1 y | 1.5 | 2 | 3	0.5 + 1 + 0.5			
	Horizontal asymptote : $y = 1$	1			
		2 (1mark for the line $y = 1$ and 1 mark for the correct sketch of the graph)			

Item #	Answer	Marks	Taxonomy	Topic	Page
18	$A(t) = 400\left(\frac{3}{2}\right)^t$ $900 = 400\left(\frac{3}{2}\right)^t$ $\frac{900}{400} = \left(\frac{3}{2}\right)^t$ $\frac{9}{4} = \left(\frac{3}{2}\right)^t$ $\left(\frac{3}{2}\right)^2 = \left(\frac{3}{2}\right)^t$ $t = 2$ years	***3marks*** 0.5 0.5 0.5 1 0.5	Reasoning	Exp. & Trig Functions	527

Item #	Answer	Marks	Taxonomy	Topic	Page
19		***3 marks***	Knowledge	More Function	560
	Vertical asymptote is $x = -1$	1.5			
	Horizontal asymptote is $y = 1$	1.5			

Item #	Answer	Marks	Taxonomy	Topic	Page
20		***6 marks***	Application	More Function	567
	$x^2 - 3x - 3 = 5 - x$	1			
	$x^2 - 2x - 8 = 0$	1			
	$(x - 4)(x + 2) = 0$	1			
	$x = 4 \quad \text{or} \quad x = -2$	0.5 + 0.5			
	when $x = 4 \rightarrow y = 1$	0.5			
	when $x = -2 \rightarrow y = 7$	0.5			
	∴The intersection points are: (4, 1) and (-2, 7)	0.5 + 0.5			

Item #	Answer	Marks	Taxonomy	Topic	Page
21	***3 marks*** $f(x) = 2x^3 + ax^2 - 2ax$ From the figure the point of x-intercept: $(1\ ,0) \ \rightarrow \ f(1) = 0$ $f(1) = 0 \rightarrow 2(1)^3 + a(1)^2 - 2a(1) = \ 0$ $2 + a \ - 2a = \ 0$ $2 - a = \ 0$ $a \ = 2$ **Remark:** student can use $(-2,0)$ or $(-1,4)$ as points of x-intercept which will gives the same value of a.	0.5 0.5 + 0.5 + 0.5 0.5 0.5	Reasoning	More Function	551

Item #	Answer	Marks	Taxonomy	Topic	Page
22	Since $r = \frac{s_{xy}}{s_x s_y}$ $\therefore r = \frac{13}{(3.16)(4.24)}$ $\doteqdot 0.97$	***3 marks*** 1+ 0.5+0.5 1	Knowledge	Tow Variable Statistic	578 + 581

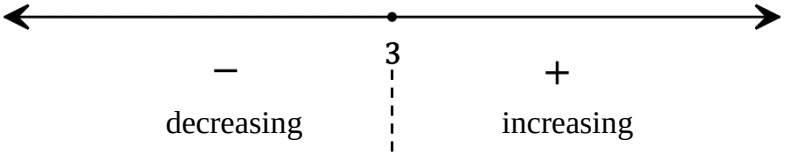
<table>
<tr><th>Item #</th><th>Answer</th><th>Marks</th><th>Taxonomy</th><th>Topic</th><th>Page</th></tr>
<tr><td>23</td><td>
<table>
<tr><th>f_o</th><th>f_e</th><th>$f_o - f_e$</th><th>$(f_o - f_e)^2$</th><th>$\frac{(f_o - f_e)^2}{f_e}$</th></tr>
<tr><td>25</td><td>23.2</td><td>1.8</td><td>3.24</td><td>0.139655</td></tr>
<tr><td>16</td><td>17.8</td><td>-1.8</td><td>3.24</td><td>0.182022</td></tr>
<tr><td>62</td><td>63.8</td><td>-1.8</td><td>3.24</td><td>0.050784</td></tr>
<tr><td>51</td><td>49.2</td><td>1.8</td><td>3.24</td><td>0.065854</td></tr>
<tr><td colspan="3"></td><td>Total
(X^2_{calc})</td><td>0.438315</td></tr>
</table>
</td><td>4 marks
1
1
1
1</td><td>Knowledge</td><td>Tow Variable Statistic</td><td>592</td></tr>
</table>

Item #	Answer	Marks	Taxonomy	Topic	Page
24		***3 marks***	Reasoning	Tow Variable Statistic	585
	Since $y - \bar{y} = \frac{s_{xy}}{s_x^2}(x - \bar{x})$				
	$\therefore y - \frac{14}{3} = \frac{3}{4}(x - \bar{x})$	1			
	To find $\bar{x}$ we use the formula of S_{xy}				
	$\because S_{xy} = \frac{\sum xy}{n} - \bar{x}\,\bar{y}$				
	$\therefore 2 = \frac{48}{3} - \frac{14}{3}\bar{x}$	0.5			
	$\rightarrow \bar{x} = \frac{48 - 6}{14} = 3$	1			
	$\therefore$ The least squares regression line for y on x				
	$y - \frac{14}{3} = \frac{3}{4}(x - 3)$	0.5			

Answers Scheme
End of Year Exam 2022-2023: Second Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
25	$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0} \frac{5(x+h)-5x}{h}$ $= \lim_{h\to 0} \frac{5x+5h-5x}{h}$ $= \lim_{h\to 0} \frac{5h}{h}$ $= 5$	***5marks*** 1+1 0.5 + 0.5 1 1	Knowledge	Introductory Differential Calculus	613 + 614

Item #	Answer	Marks	Taxonomy	Topic	Page
26	***5 marks*** $f'(x) = 12x^2 + 2$ $f'(1) = 12(1)^2 + 2 = 14$ Since $f(x)$ has a tangent at $x = 1$ ∴ The tangent line touch $f(x)$ at the point $(a\ , b)$ where $a = 1$ $b = f(1) = 4(1)^3 + 2(1) = 6$ The equation of the tangent $y - b = f'(a)(x - a)$ $\therefore y - 6 = 14(x - 1)$ Or $y = 14x - 8$	0.5+0.5 1 1+0.5 0.5+0.5+0.5	Application	Introductory Differential Calculus	617 + 618

Item #	Answer	Marks	Taxonomy	Topic	Page
27	***5 marks*** $f'(x) = 2x - 6$ To find stationary point(s) → Let $f'(x) = 0$ $\therefore\ 2x - 6 = 0\ \rightarrow x = \frac{6}{2} = 3$ $f'(x)$ has sign diagram as following:  $\therefore$ We have local minimum at $x = 3$ $f(3) = (3)^2 - 6(3) = -9$ $\therefore$ Local minimum at $(3, -9)$	1 0.5 0.5 + 0.5 0.5 + 0.5 0.5 0.5 0.5	Application	Introductory Differential Calculus	625

Item #	Answer	Marks	Taxonomy	Topic	Page
28	$f(x) = \frac{3a}{x} = 3ax^{-1}$ $f'(x) = -3ax^{-2}$ or $f'(x) = \frac{-3a}{x^2}$ Since the tangent has gradient 6 at $x = 1 \rightarrow f'(1) = 6$ But $f'(1) = \frac{-3a}{1} = -3a$ $\therefore -3a = 6$ $\therefore a = \frac{6}{-3}$ $\therefore a = -2$	***3 marks*** 1 0.5 0.5 0.5 0.5	Reasoning	Introductory Differential Calculus	619

"End of the Answer scheme"

Sultanate of Oman
Ministry of Education

Diploma, Bilingual Private Schools, Applied Mathematics

Second Semester-Second Session

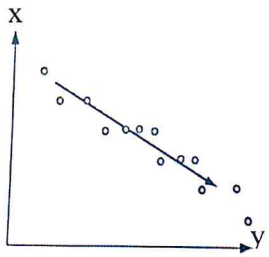
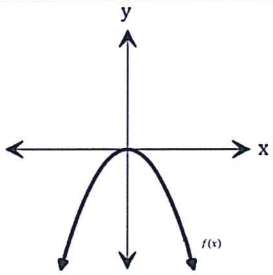
Academic Year: 2022/2023

Answer Scheme

Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Applied Mathematics – Bilingual Private Schools

Question One: (Multiple choice) **[14 marks]**

Each item carries 1 marks

Item #	Answer	Taxonomy	Topic	Page
1	2	Knowledge	Exp. & Trig Functions	518
2	$y = 3$	Knowledge	Exp. & Trig Functions	522
3	5	Application	Exp. & Trig Functions	530
4	1	Reasoning	Exp. & Trig Functions	522
5	$f(x) = x^3 + x^2$	Knowledge	More functions	547
6	$y = (x^2 - 2)(x - 1)$	Application	More functions	556
7	$y = 2x^3 - 2x^2 - 4x$	Application	More functions	549
8		Knowledge	Two Variable Statistic	573
9	6	Application	Two Variable Statistic	593
10	5.99	Application	Two Variable Statistic	595
11	$-6x^{-4}$	Knowledge	Introductory Differential Calculus	611
12		Application	Introductory Differential Calculus	621
13	2	Application	Introductory Differential Calculus	620
14	-5	Reasoning	Introductory Differential Calculus	619

Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Applied Mathematics – Bilingual Private Schools

Extended Response Questions

Item #	Answer	Marks	Taxonomy	Topic	Page
15		***4marks***	Knowledge	Exp. & Trig Functions	533 + 535
	Amplitude is 9, then $\|A\| = 9$	1			
	horizontal dilation of factor $\frac{1}{4}$, $\frac{1}{B} = \frac{1}{4}$	1			
	$B = 4$				
	vertical shift by 5 units, $C = 5$	1			
	$y = 9\cos 4x + 5$	1			

Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
16		***4 marks***	Application	Exp. & Trig Functions	534
	$\text{period} = \frac{360^\circ}{B}$				
	$60^\circ = \frac{360^\circ}{2n}$	1			
	$2n = \frac{360^\circ}{60^\circ}$	1			
	$2n = 6$	1			
	$n = 3$	1			

Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Applied Mathematics – Bilingual Private Schools

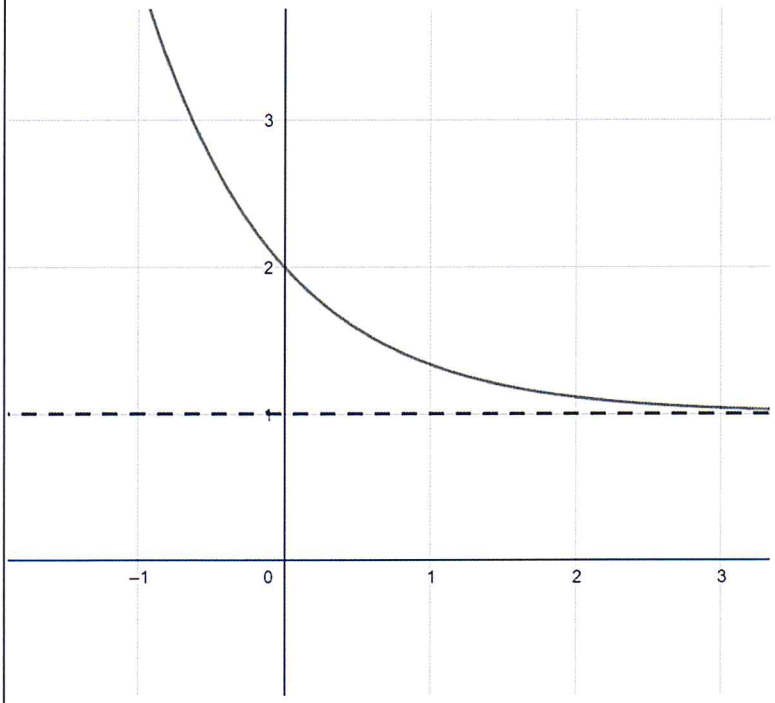
Item #	Answer	Marks	Taxonomy	Topic	Page
17		*5 marks*	Application	Exp. & Trig Functions	519 + 520 + 522

x	-1	0	1
y	4	2	$\frac{4}{3}$

0.5 + 1 + 0.5

Horizontal asymptote : $y = 1$

1



2
(1mark for the line $y = 1$ and 1 mark for the correct sketch of the graph)

Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
18		*3marks*	Reasoning	Exp. & Trig Functions	527
	$V(t) = 45000\left(\frac{2}{3}\right)^t$				
	$20000 = 45000\left(\frac{2}{3}\right)^t$	0.5			
	$\frac{20000}{45000} = \left(\frac{2}{3}\right)^t$	0.5			
	$\frac{20}{45} = \left(\frac{2}{3}\right)^t$	0.5			
	$\frac{4}{9} = \left(\frac{2}{3}\right)^t$	0.5			
	$\left(\frac{2}{3}\right)^2 = \left(\frac{2}{3}\right)^t$	0.5			
	$t = 2$ years	0.5			

Item #	Answer	Marks	Taxonomy	Topic	Page
19		***3 marks***	Knowledge	More Function	560
	$y-intercept$ is 3	1.5			
	Vertical asymptote $x = -1$	1.5			

Item #	Answer	Marks	Taxonomy	Topic	Page
20		*6 marks*	Application	More Function	567
	$\frac{2}{x} = 3 - x$	1			
	$2 = 3x - x^2$	1			
	$x^2 - 3x + 2 = 0$ $(x-2)(x-1) = 0$	1			
	$x = 2 \; or \; x = 1$	0.5 + 0.5			
	when $x = 2 \rightarrow y = 1$	0.5			
	when $x = 1 \rightarrow y = 2$	0.5			
	∴The intersection points are: $(2, 1)$ and $(1, 2)$	0.5 + 0.5			

Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
21	$g(x) = x^3$ $f(x) = (x-5)^3 + 2$	*3 marks* 1+1+1	Reasoning	More Function	549

Item #	Answer	Marks	Taxonomy	Topic	Page
22	Since $r = \frac{S_{xy}}{S_x S_y}$ $\therefore r = \frac{-29}{(5.48)(6.16)}$ $\div -0.86$	*3 marks* 1+ 0.5+0.5 1	Knowledge	Tow Variable Statistic	578 + 581

Item #	Answer	Marks	Taxonomy	Topic	Page
23		*4 marks*	Knowledge	Tow Variable Statistic	592

f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$	
125	120.2	4.8	23.04	0.1917	1
116	120.8	-4.8	23.04	0.1907	1
92	96.8	-4.8	23.04	0.2380	
102	97.2	4.8	23.04	0.2370	1
			Total (X^2_{calc})	0.8574	1

Item #	Answer	Marks	Taxonomy	Topic	Page
24		*3 marks*	Reasoning	Tow Variable Statistic	585
	Since $y - \bar{y} = \frac{s_{xy}}{s_x^2}(x - \bar{x})$				
	$\therefore\ y - 6 = \frac{-5.8}{s_x^2}(x - \bar{x})$	1			
	To find s_x^2 we use the formula of $s_x^2 = \frac{\Sigma x^2}{n} - \bar{x}^2$				
	$s_x^2 = \frac{155}{5} - 5^2 = 6$	1			
	$\therefore$ The least squares regression line for y on x				
	$y - 6 = \frac{-5.8}{6}(x - 5)$	0.5+0.5			

Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
25	$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0} \frac{7(x+h)-7x}{h}$ $= \lim_{h\to 0} \frac{7x+7h-7x}{h}$ $= \lim_{h\to 0} \frac{7h}{h}$ $= 7$	***5marks*** 1+1 0.5 + 0.5 1 1	Knowledge	Introductory Differential Calculus	613 + 614

Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
26		***5 marks***	Application	Introductory Differential Calculus	618
	$f'(x) = 2x - 6$	1			
	Tangent is horizontal → gradient of tangent $= 0$				
	$\therefore f'(x) = 0$	0.5			
	$\therefore 2x - 6 = 0$	0.5			
	$2x = 6 \rightarrow \quad x = \frac{6}{2} = 3$	1			
	When $x = 3 \rightarrow f(3) = 3^2 - 6 \times 3 + 4 = -5$	1			
	$\therefore$ Tangent is horizontal at the point $(3, -5)$	1			

Item #	Answer	Marks	Taxonomy	Topic	Page
27	***5 marks***		Application	Introductory Differential Calculus	625
	$f'(x) = 2x - 8$	1			
	To find stationary point(s) → Let $f'(x) = 0$	0.5			
	$\therefore\ 2x - 8 = 0 \rightarrow x = \frac{8}{2} = 4$	0.5 + 0.5			
	$f'(x)$ has sign diagram as following:  	0.5 + 0.5			
	∴ We have local minimum at $x = 4$	0.5			
	$f(4) = (4)^2 - 8(4) = -16$	0.5			
	∴ Local minimum at $(4, -16)$	0.5			

Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
28	$f(x) = ax^3 - 27x + 5$ $f'(x) = 3ax^2 - 27$ Since $f(x)$ has stationary points at $x = 1 \rightarrow f'(1) = 0$ $0 = 3a(1)^2 - 27$ $3a = 27$ $a = 9$	*3 mark* 0.5+0.5+0.5 0.5 0.5 0.5	Reasoning	Introductory Differential Calculus	632

"End of the Answer scheme"

SULTANATE OF OMAN
MINISTRY OF EDUCATION
GENERAL EDUCATION DIPLOMA
BILINGUAL PRIVATE SCHOOLS
End of Year Exam– First Session– Applied Mathematics – 2020/2021

Marking Guide

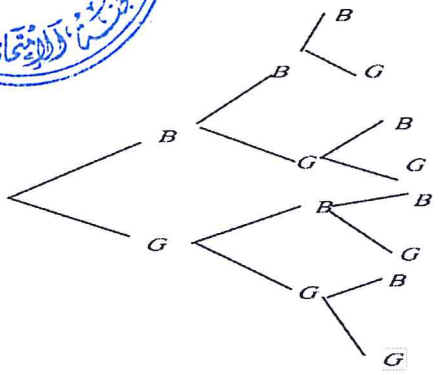
Part One: (Multiple choice): 12 × 1 = 12 marks

Item No.	Answer	Page(s)	Topic	Cognitive domain
1	1083.40	424	Financial Mathematics	Knowledge
2	86000	430	Financial Mathematics	Application
3	6	428	Financial Mathematics	Application
4	403.34	446	Financial Mathematics	Application
5	20000	433	Financial Mathematics	Reasoning
6	$\frac{1}{2}$	465	Probability	Knowledge
7	0.56	470	Probability	Application
8	2	533	Exponential and trigonometric function	Knowledge
9	$y = 2\,sin(3x)$	535	Exponential and trigonometric function	Application
10	$\frac{46}{9}$	518	Exponential and trigonometric function	Application
11	x	615	Introductory differential calculus	Knowledge
12	0	616	Introductory differential calculus	Reasoning

Part two: Extended Response:

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
13	$\text{cost} = \frac{400}{0.11740} \times 1.01$ ≈ 3441.23 Norwegian kroner	4 marks 1+1+1 1	Financial Mathematics	426	Knowledge
14	$A = C \times (1 + \frac{r}{100})^n$ $A = 5100 \times (1 + \frac{5}{100})^2$ $A = 5100 \times (1 + 0.05)^2 == \$5622.75$	3 marks 1+1 1	Financial Mathematics	533	Application
15	a) receives: $\$600 \times 0.5035 = £302.1$ b) $\frac{302.1}{0.530} = 570$ c) the resultant commission $600 - 570 = \$30$	6 marks 1+1 1+1 1+1	Financial Mathematics	425	Application

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
16	$A = c(1+\frac{r}{100})^n$ $12288 = 30000(1+\frac{r}{100})^4$ $\frac{12288}{30000} = (1+\frac{r}{100})^4$ $\frac{256}{625} = (1+\frac{r}{100})^4$ $\frac{4}{5} = 1+\frac{r}{100}$ $\frac{r}{100} = 1-\frac{4}{5}$ $\frac{r}{100} = \frac{1}{5}$ $r = 20\%$	4 marks 1 1 1 1	Financial Mathematics	445	Reasoning
17	S={HH,HT,TH,TT}	3 marks $\frac{1}{2}+1+1+\frac{1}{2}$	Probability	462	Knowledge
18	a) $\frac{2}{25}$ b) $\frac{9}{25}$	4 marks 1+1 1+1	Probability	468	Application

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
19	 The probability that a randomly selected 3-child family consists of all boys. $P(all\ boys) = \frac{1}{8}$	3 marks $\frac{1}{2}+\frac{1}{2}+1$ $\frac{1}{2}+\frac{1}{2}$	Probability	466	Reasoning
20	$\frac{50-(-10)}{2} = 30$ cm	3 marks 1+1+1	Exponential and trigonometric function	531	Knowledge
21	a) at $t = 0$ $P(0) = 200 + 75\sin(90 \times 0) = 200$ crocodiles b) at $t = 2.5$ $P(2.5) = 200 + 75\sin(90 \times 2.5) \approx 147$ crocodiles (Note: if the student found the answer from the equation directly then count full mark)	6 marks 1 1+1 1+1+1	Exponential and trigonometric function	541 - 542	Application

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
22	$3y = a(5^x + 2)$ $3(-4) = a\,(5^0 + 2)$ $-12 = a(3)$ $a = -4$	3 Marks 1 1 1	Exponential and trigonometric function	522	Reasoning
23	$\frac{dy}{dx} = 3x^2 - 12x + 9 + 0$	4 marks 1+1+1+1	Introductory differential calculus	616	Knowledge

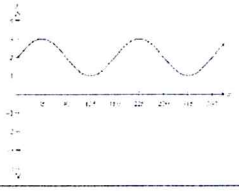
Q. No.	Answer	Mark	Topic	Page	Cognitive domain
24		5 marks	Introductory differential calculus	613	Application
	$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$				
	$= \lim_{h\to 0} \frac{2(x+h)^2+1-(2x^2+1)}{h}$	1			
	$= \lim_{h\to 0} \frac{2[x^2+2xh+h^2]-2x^2}{h}$	$1\frac{1}{2}$			
	$= \lim_{h\to 0} \frac{4xh+2h^2}{h}$	$\frac{1}{2}$			
	$= \lim_{h\to 0} \frac{h(4x+2h)}{h}$	1			
	$= 4x$	1			

(End of the Marking Guide)

SULTANATE OF OMAN
MINISTRY OF EDUCATION
GENERAL EDUCATION DIPLOMA
BILINGUAL PRIVATE SCHOOLS
End of Year Exam– Second Session– Applied Mathematics – 2020/2021

Marking Guide

Part One: (Multiple choice): 12 × 1 = 12 marks

Item No.	Answer	Page(s)	Topic	Cognitive domain
1	38324.35	426	Financial Mathematics	Knowledge
2	9366.67	433	Financial Mathematics	Application
3	8104.20	424	Financial Mathematics	Application
4	27635.63	444	Financial Mathematics	Application
5	6	425	Financial Mathematics	Reasoning
6	$\frac{1}{6}$	465	Probability	Knowledge
7	$\frac{1}{4}$	470	Probability	Application
8	9	519	Exponential and trigonometric function	Knowledge
9	3	535	Exponential and trigonometric function	Application
10		537	Exponential and trigonometric function	Application
11	8	616	Introductory differential calculus	Knowledge
12	2	614	Introductory differential calculus	Reasoning

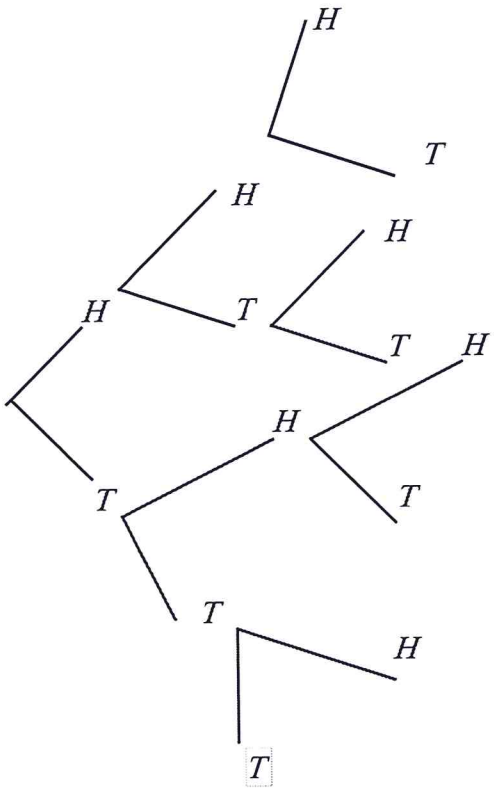
11	8	616	Introductory differential calculus	Knowledge
12	2	614	Introductory differential calculus	Reasoning

Part two: Extended Response:

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
13	$I = \$500000 \times 0.07 \times 4 = \$140000$	4 marks 1+1+1+1	Financial Mathematics	427	Knowledge
14	$I = 80000 \times 0.05 \times 5\frac{1}{2}$ $I = 22000$ OMR $R_P = \frac{C+I}{N}$ $R_P = \frac{80000+22000}{66}$ $R_P = 1545.45$ OMR	3 marks $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$ $\frac{1}{2}$	Financial Mathematics	430	Application

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
15	7.5% p.a. compound monthly $i = \frac{0.075}{12} = 0.00625$ $c = 12$ $r = (1+i)^c - 1$ $r = (1+0.00625)^{12} - 1$ $r = 0.0776 \ldots\ldots$ Effective rate is 7.76% 7% p.a. compound half yearly $= \frac{0.07}{2} = 0.035$ $c = 2$ $r = (1+i)^c - 1$ $r = (1+0.035)^2 - 1$ $r = 0.0712 \ldots\ldots$ Effective rate is 7.12% Thus the better rate for an investment is7.5% p.a. compound monthly	6 marks 1 $\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1	Financial Mathematics	441-442	Application
16	$4448.88 = \text{monthly repayments per } \$1000 \times 200$ $\text{monthly repayment per } \$1000 = \frac{4448.88}{200}$ $\text{monthly repayment per } \$1000 = 22.2444$ From the table of monthly repayments per $1000, loan term (months)=60 months So the number of years is 5 years	4 marks 1 1 1 1	Financial Mathematics	446	Reasoning
17	sample space={1H,1T,2H,2T,3H,3T}	3 marks $\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$	463	Probability	K

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
18	$P(\text{4 computers are defictive}) = \frac{4}{10} \times \frac{3}{9} \times \frac{2}{8} \times \frac{1}{7}$ $= \frac{1}{210}$	4 marks 1+1+1 1	472	Probability	A

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
19	 $P(all\ heads) = \frac{1}{8}$	3 marks $\frac{1}{2}+\frac{1}{2}+1$ $\frac{1}{2}+\frac{1}{2}$	Probability	466	Reasoning
20	a) 6 b) $the\ period = \frac{360}{3} = 120^{\circ}$	3 marks 1 1+1	Exponential and trigonometric function	537	Knowledge

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
21	6 marks a) initial population at $t = 0$ $P(0) = 6500 + 3000\sin(90 \times 0) \;\; = 6500$ grasshoppers b) at $t = 5.5$ $P(5.5) = 6500 + 3000\sin(90 \times 5.5) \approx 8621$ grasshoppers	1 1+1 1 1+1	Exponential and trigonometric function	541 - 542	Application
22	3 marks $2y = 6(5^x + a)$ $y = \frac{6}{2}(5^x + a)$ $y = 3 \times 5^x + 3a$ $-6 = 3 + 3a$ $3a = -9$ $a = -3$	1 1 1	Exponential and trigonometric function	522	Reasoning
23	4 marks $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{2(x+h) + 1 - (2x+1)}{h}$ $= \lim_{h\to 0} \frac{2x + 2h + 1 - 2x - 1}{h}$ $= \lim_{h\to 0} \frac{2h}{h}$ $=2$	1 1 1 1	Introductory differential calculus	613	Knowledge

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
24	$f'(x) = 3ax^2 - 6$ $f'(1) = 3a - 6 = 0$ a=2	5 marks 1+1 1+1 1	Introductory differential calculus	609	Application

(End of the Marking Guide)