Further Mathematics 9649 ANNEX

Paper 1		
QN	**TOPIC** (***Pls Select***)	**ANSWERS** (***Exclude graphs and text answers***)
1	Apps of Integration (incl. polar)	$k = 2$
2	Recurrence Relations	$x_n = \dfrac{-2 + 5 \cdot 4^{n-1}}{3n^n}$
3	Differential Equations	(a) $\ln \dfrac{x^4(x-y)}{y+x} = \dfrac{2x}{y+x} + c$ (b) 2.375 (c) over-estimate
4	Linear Algebra	(ii)(a) $\mathbf{M} = \begin{pmatrix} 0 & -a_3 & a_2 \\ a_3 & 0 & -a_1 \\ -a_2 & a_1 & 0 \end{pmatrix}$ (b) No (c) $\ker(T) = \{k\mathbf{a} \mid k \in \mathbb{R}\}$, $\mathrm{R}(T) = \{\mathbf{v} \in \mathbb{R}^3 \mid \mathbf{a} \cdot \mathbf{v} = 0\}$
5	Linear Algebra	(i) 1 and $\begin{pmatrix} \cos\theta \\ \sin\theta \end{pmatrix}$; –1 and $\begin{pmatrix} -\sin\theta \\ \cos\theta \end{pmatrix}$ (ii) $\mathbf{T}_\theta = \mathbf{R}\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\mathbf{R}^{-1}$ (iii) $\begin{pmatrix} -1 + \dfrac{\sqrt{3}}{2} \\ \sqrt{3} + \dfrac{1}{2} \end{pmatrix}$
6	Numerical Methods	(i) 2 (ii) 2.11 (iii) over-estimate (v) 2.06
7	Apps of Integration (incl. polar)	(i) $\dfrac{3\pi}{2}$ (ii) $2\pi a^3\left[\frac{27}{16}\pi^2 + 3\pi + \frac{17}{12}\right]$
8	Differential Equations	(a) $v = \dfrac{C - (C - kv_0)\mathrm{e}^{-\frac{kt}{m}}}{k}$ (b) $v \to \dfrac{C}{k}$
9	Recurrence Relations	(a)(i) $u_r = \left(\dfrac{1}{2}\right)^r \left(A\sin\dfrac{r\pi}{3} + B\cos\dfrac{r\pi}{3}\right)$ (ii) $\alpha = -\dfrac{1}{8}$, $\displaystyle\sum_{r=1}^{\infty} u_{3r-2} = \frac{8}{9}u_1$

		(b)(ii) $a_n = \frac{1}{4}(-1)^n + \frac{3}{4}(3)^n$
10	Conics	(i) $e = 0.365$, $a = 2.56$ (ii) 41.4 days (iii) 5.84 days 287 days
11	FM P1 Q11 Topic	
12	FM P1 Q12 Topic	
13	FM P1 Q13 Topic	
14	FM P1 Q14 Topic	

Paper 2

QN	TOPIC (*Pls Select*)	ANSWERS (*Exclude graphs and text answers*)
1	Mathematical Induction	$\frac{1}{2}$
2	Linear Algebra	(ii)(a) Yes (b) No
3	Numerical Methods	(i) $\frac{80}{9} = 8\frac{8}{9}$ (ii) over-estimate (iii) $\frac{220}{27} = 8\frac{4}{27}$ (iv) $\frac{80}{9}\left(\frac{1}{\ln 3}\right)$ (vi) 0.706%
4	Differential Equations	(b) $y = -\frac{20}{27}e^{-6x} - \frac{16}{27}e^{-3x} + \frac{16}{9}x + \frac{4}{3}$, $z = \frac{20}{27}e^{-6x} - \frac{8}{27}e^{-3x} + \frac{32}{9}x - \frac{4}{9}$
5	Complex Numbers	(a) $z = e^{-i\left(\frac{11\pi}{12}\right)}$, $e^{-i\left(\frac{5\pi}{12}\right)}$, $e^{i\left(\frac{\pi}{12}\right)}$, $e^{i\left(\frac{7\pi}{12}\right)}$ (d) $e^{-i\left(\frac{5\pi}{12}\right)}$
6	Hypo Testing & Confidence Intervals	(a) $(0.7550, 0.8006)$ (b) 1169
7	Chi-square Tests	$p = 0.780$, do not reject H_0 No change
8	Non-parametric Tests	(b) do not reject H_0 (c) $1.4 < b < 1.6$
9	Continuous RV	(a) $f(y) = \frac{2}{25}(1-y), -4 < y < 1$ (b) $-\frac{7}{3}$
10	Discrete RV	(ii) 0.107 (iii) 0.655 (iv) $f(t) = \frac{1}{72}e^{-\frac{1}{72}t}, t > 0$

		(v) 86
11	Hypo Testing & Confidence Intervals	(i) 1-sample *t*-test (ii) 3.34 (iii) $p = 0.750$, do not reject H_0
12	FM P2 Q12 Topic	
13	FM P2 Q13 Topic	
14	FM P2 Q14 Topic	