Further Mathematics 9649 ANNEX

Paper 1		
QN	**TOPIC** (***Pls Select***)	**ANSWERS** (***Exclude graphs and text answers***)
1	Linear Algebra	(b) 4 (c) $\mathbf{P} = \begin{pmatrix} 1 & 1 & 1 \\ -1 & 2 & 1 \\ 1 & -3 & -2 \end{pmatrix}$ $\mathbf{D} = \begin{pmatrix} 216 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 27 \end{pmatrix}$
2	Recurrence Relations	(a) $p_{n+1} = 0.72p_n + 14000$ (b) $p_n = 170000(0.72)^n + 50000$ Last part: 9
3	Complex Numbers	(a) $2e^{-i\frac{14\pi}{15}}, 2e^{-i\frac{8\pi}{15}}, 2e^{-i\frac{2\pi}{15}}, 2e^{i\frac{4\pi}{15}}, 2e^{i\frac{2\pi}{3}}$ (b) $z = 2e^{-i\frac{2\pi}{15}}$
4	Conics	(a) $y - y_1 = m(x - x_1)$ (d) $x^2 + y^2 = 3$; circle with centre O and radius $\sqrt{3}$
5	Linear Algebra	(a) $\left\{\begin{pmatrix}1\\1\\1\\1\end{pmatrix}, \begin{pmatrix}1\\4\\7\\2\end{pmatrix}, \begin{pmatrix}1\\7\\11\\5\end{pmatrix}\right\}$ (b) $\left\{\begin{pmatrix}1\\1\\2\\0\end{pmatrix}, \begin{pmatrix}1\\1\\0\\2\end{pmatrix}\right\}$ (c) No (d) 3
6	Conics	(a) $at^2 + a$ (b) – (c) $y = \frac{1}{t}x + at$
7	Complex Numbers	(a) (ii) $\frac{1}{32}(10 + 15\cos 2\theta + 6\cos 4\theta + \cos 6\theta)$
8	Linear Algebra	(c) Hyperbola (d) (i) $\sqrt{3}$ (ii) $(\sqrt{3}, 0)$ and $(-\sqrt{3}, 0)$

		(iii) $x=\frac{1}{\sqrt{3}}$ and $x=-\frac{1}{\sqrt{3}}$
9	Apps of Integration (incl. polar)	(a) $2\frac{2}{3}$ units (b) $\frac{\pi}{3}\left[5(\ln 3)^2-8\ln 3+4\right]$ (d) 0.441 units
10	Recurrence Relations	(a) 4 (d) 4
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	Recurrence Relations	$X_n=\mathrm{e}^{2^n\left[A\cos\frac{n\pi}{3}+B\sin\frac{n\pi}{3}\right]}$
2	Apps of Integration (incl. polar)	(b) $\frac{3\pi}{8}$ (c) $\frac{1}{6}\left(2+3\sqrt{3}\right)$ (d) $\frac{4}{9}\left(2+3\sqrt{3}\right)$
3	Apps of Integration (incl. polar)	(a) $(\pi r, 2r)$ (b) $\frac{64}{3}\pi r^2$ units^2
4	Differential Equations	(a) $y=\frac{1}{k+1}\left(t-t^{-k}\right)$ (b) $y\approx 0.182$ (c) Overestimation
5	Mathematical Induction	(a) $\mathrm{e}^{x\sqrt{3}}\sin x$ (d) (i) 0.609 (ii) $(n-1)\pi$
6	Discrete RV	(b) 19 (c) 0.0226
7	Hypo Testing & Confidence Intervals	p-value = 0.225 > α = 0.1, we do not reject H_0
8	Chi-square Tests	(a) 22.5, 45, 112.5, 7.5, 15, 37.5 (b) 18, 42, 12, 18 (c) p-value = 0.0408 < α, we reject H_0.

9	Continuous RV	(a) $\mathrm{F}(x)=\begin{cases}0, & x<0.1,\\ 100(x-0.1)^2, & 0.1\le x\le 0.2,\\ 1, & x>0.2\end{cases}$ (c) $\mathrm{g}(y)=40000(y-0.1)^3$; 0.18 (d) 40,72 (e) p-value = 0.117 > α , we do not reject H_0 .
10	Non-parametric Tests	(a) p-value = 0.00440 ≤ α = 0.01, we reject H_0 (b) $w \le 1.34$ (c) p-value = 0.144 > α , we do not reject H_0 (d) 16
11	FM P2 Q11 Topic	
12	FM P2 Q12 Topic	
13	FM P2 Q13 Topic	
14	FM P2 Q14 Topic	