Question	Answer	Marks	Guidance
1(i)	Po(2.25)	**B1**	Stated or implied
	$e^{-2.25}(1 + 2.25 + \frac{2.25^2}{2})$	**M1**	Allow any λ, one end error
	= 0.609 (3 sf)	**A1**	SC B1 Use of B(75,0.03) leading to 0.608
		3	
1(ii)	μ = 2.25, which is less than 5; n large	**B1**	Allow np<5 and n large or p<0.1 and n>50, no contradictions
		1	

Question	Answer	Marks	Guidance
2(i)	213, 165, 73, 196 Allow 073	**B1**	For 3-digit no, < 265, consisting of three consecutive integers from given digits, backwards or forward. (73 or 073 counts as a 3-digit no.)
		B1	For another three such. Other answers may be valid. If other method used, method must be clear
		2	

Question	Answer	Marks	Guidance
2(ii)	$\frac{510}{25} = \frac{102}{5}$ or 20.4	B1	
	$\frac{25}{24}\left[\frac{13225}{25} - \left(\frac{102}{5}\right)^2\right]$	M1	$\frac{1}{24}\left(13225 - \frac{510^2}{25}\right)$
	118 (3 sf) or $\frac{2821}{24}$	A1	
		3	
2(iii)	(Average) weekly earnings of all students in Amy's year	B1	Not 'All students in Amy's year'
		1	

Question	Answer	Marks	Guidance
3	$\dfrac{\frac{8}{64}\times(1-\frac{8}{64})}{64}$ (= $\dfrac{7}{4096}$ or 0.00171)	**M1**	OE, e.g. $\dfrac{\frac{1}{8}\times\frac{7}{8}}{64}$
	$2\times z\sqrt{"\dfrac{7}{4096}"}=0.130$	**M1**	Correct equation using their variance
	$z = 1.572$	**A1**	
	$\phi("1.572")$ (= 0.942) (0.942 – (1 – 0.942) = 0.884)	**M1**	$2\phi(\text{their } z)$ -1
	$\alpha = 88$	**A1**	CAO
		5	

Question	Answer	Marks	Guidance
4(i)	No of males leaving (to do eng) each yr has const mean or Males leave (to do eng) indep of other males leaving (to do eng) or Males leave (to do eng) at random	B1	One of these or any equiv statement in context.
		1	
4(ii)	$\lambda = 3.9$	B1	
	$1 - e^{-3.9}(1 + 3.9 + \frac{3.9^2}{2!} + \frac{3.9^3}{3!})$	M1	Any λ. Allow one end error or extra term.
	0.546753 or 0.547 (3 sf)	A1	
		3	
4(iii)	$P(F = 0 \text{ and } M > 3) =$ $e^{-0.8} \times \left[1 - e^{-3.1}\left(1 + 3.1 + \frac{3.1^2}{2!} + \frac{3.1^3}{3!}\right)\right]$ (= 0.16857)	M1	Attempt $P(F = 0) \times P(M > 3)$ allow one end error for $P(M > 3)$ provided $\lambda = 3.1$
	$\frac{P(F=0 \text{ and } M>3)}{P(M+F>3)}$ $\frac{"0.16857"}{"0.54675"}$	M1	Attempted, allow any probability/their **(ii)** provided the answer is <1
	= 0.308 (3 sf)	A1	
		3	

Question	Answer	Marks	Guidance
5(i)	Assume (pop) sd same (0.3) H_0: Pop mean = 2.4	**B1**	
	H_1: Pop mean ≠ 2.4	**B1**	Allow 'μ' but not just 'mean'
	$\pm\frac{2.3-2.4}{\frac{0.3}{\sqrt{30}}}$	**M1**	Must have $\sqrt{30}$, Critical region approach (2.293, 2.507) or (2.193, 2.407)
	= ±1.826	**A1**	
	comp z = ±1.96	**M1**	Valid comparison (e.g. compare 0.034 with 0.025)
	No evidence that mean time changed	**A1f**	In context, allow accept H_0 if correctly defined, no contradictions. One-tail test can score B1, B0, M1, A1, M1, A0 Max 4/6
		6	
5(ii)(a)	0.05	**B1**	
		1	
5(ii)(b)	Concluding mean time has not changed when it has.	**B1**	OE, must have e.g. conclude/accept SR Allow mean has decreased if a one tailed test in Part **(i)**
		1	

Question	Answer	Marks	Guidance
6(i)	$E(T) = 4.5 + 2.3$ (= 6.8) $Var(T) = 1.1^2 + 0.7^2$ (= 1.7)	**M1**	Both methods seen or implied
	$\frac{8.5 - "6.8"}{\sqrt{"1.7"}}$ (= 1.304)	**M1**	Correct stand'n using their μ and σ^2 must be a combination of the two variables
	ϕ("1.304")	**M1**	Area consistent with their working
	= 0.904 (3 sf)	**A1**	
		4	
6(ii)	$E(D) = 4.5 - 2 \times 2.3$ or –0.1	**M1**	
	$Var(D) = 1.1^2 + 2^2 \times 0.7^2$ or 3.17	**M1**	Both can seen or implied
	$\frac{0 - ('-0.1')}{\sqrt{'3.17'}}$ (= 0.056)	**M1**	Correct stand'n using their μ and σ^2 must be a Combination of the two variables
	1 – ϕ("0.056")	**M1**	Area consistent with their working
	= 0.478 (3 sf)	**A1**	
		5	

Question	Answer	Marks	Guidance
7(i)	$k\int_1^2 (\frac{1}{x^2}+\frac{1}{x^3})\,dx = 1$	M1	Attempt integ f(*x*) & '= 1'; ignore limits
	$k\left[-\frac{1}{x}-\frac{1}{2x^2}\right]_1^2 = 1$	A1	Correct integral & limits & '= 1'
	$k\left[-\frac{1}{2}-\frac{1}{8}+1+\frac{1}{2}\right] = 1$ $k = \frac{8}{7}$ **AG**	A1	Sufficient working must be shown, no errors seen
		3	
7(ii)	$\frac{8}{7}\int_1^2 (\frac{1}{x}+\frac{1}{x^2})\,dx$	M1	Attempt integ *x*f(*x*), ignore limits
	$= \frac{8}{7}\left[\ln x-\frac{1}{x}\right]_1^2$	A1	Correct integral & limits, condone missing k
	$= \frac{8}{7}(\ln 2+\frac{1}{2})$ or 1.36 (3 sf)	A1	
		3	

Question	Answer	Marks	Guidance
7(iii)	$\frac{8}{7}\int_{1}^{1.5}(\frac{1}{x^2}+\frac{1}{x^3})\,dx$ $=\frac{8}{7}\left[-\frac{1}{x}-\frac{1}{2x^2}\right]_1^{1.5}$	M1	Attempt integration f(x) between 1 and 1.5 or between 1.5 and 2
	$=\frac{44}{63}$ or 0.698…….	A1	Or $\frac{19}{63}$ or 0.302
	$'\frac{44}{63}'(1-'\frac{44}{63}')^2$	M1	FT their $\frac{44}{63}$
	$\times 3$	M1	Independent provided answer is <1
	= 0.191	A1	
		5	