SECOND YEAR HIGHER SECONDARY SAY/IMP. EXAMINATION, JUNE 2016.
(Finalised Scheme of Valuation)

Subject: Mathematics (Science) Code No: 2018

Qn.No		Scoring Indicators	Split Score	Total Score
1.	(a)	(ii) Zero matrix	1	1
	(b)	$A^2 = A \times A$	1/2	
		$A^2 = \begin{bmatrix} -5 & 15 \\ -10 & 10 \end{bmatrix}$	1/2	
		$A^2 - 5A + 10I = \begin{bmatrix} -5 & 15 \\ -10 & 10 \end{bmatrix} - \begin{bmatrix} 5 & 15 \\ -10 & 20 \end{bmatrix} + \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$	1	3
		$= \begin{bmatrix} -10 & 0 \\ 0 & -10 \end{bmatrix} + \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$		
		$= \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = 0$	1	
	(c)	multiplying by A^{-1} with the given matrix equation		
		we get, $A^2 A^{-1} - 5AA^{-1} + 10IA^{-1} = 0$		
		$A \cdot A \cdot A^{-1} - 5I + 10A^{-1} = 0$	1/2	
		$A - 5I + 10A^{-1} = 0$		2
		$10A^{-1} = 5I - A$	1/2	
		$A^{-1} = \frac{5I - A}{10}$		
		$A^{-1} = \frac{1}{10}\begin{bmatrix} 4 & -3 \\ 2 & 1 \end{bmatrix}$	1	
		<u>Remark:-</u> Any other method give 1 1/2 Score		

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Qn.No		Scoring Indicators	Split Score	Total Score
2	(a)	(iv) 4	1	1
	(b)	Express in the matrix form $AX=B$	$\frac{1}{2}$	
		Where $A=\begin{bmatrix}1 & 1 & 2\\ 2 & -1 & 3\\ 3 & -1 & -1\end{bmatrix}$, $X=\begin{bmatrix}x\\ y\\ z\end{bmatrix}$, $B=\begin{bmatrix}4\\ 9\\ 2\end{bmatrix}$	$\frac{1}{2}$	
		$\lvert A\rvert=\begin{vmatrix}1 & 1 & 2\\ 2 & -1 & 3\\ 3 & -1 & -1\end{vmatrix}=17$	1	
		$adj A=\begin{bmatrix}4 & -1 & 5\\ 11 & -7 & 1\\ 1 & 4 & -3\end{bmatrix}$	1	4
		$X=A^{-1}B$ $=\frac{1}{17}\begin{bmatrix}17\\ -17\\ 34\end{bmatrix}=\begin{bmatrix}1\\ -1\\ 2\end{bmatrix}$	$\frac{1}{2}$	
		$\Rightarrow x=1,\ y=-1,\ z=2$	$\frac{1}{2}$	
3	(a)	(iii) x^2+1	1	1
	(b)	$f: N\to N$, given by $f(x)=x^3$ for $x,y\in N$ $f(x)=f(y)$ $\Rightarrow x^3=y^3$ $\Rightarrow x=y$	1	
		$\therefore f$ is injective		2
		Now $2\in N$, But there doesnot exists any element x in domain N such that $f(x)=x^3=2$ $\therefore f$ is not surjective	1	
		Remark Any other method give full score		

⑤

Qn.No		Scoring Indicators	Split Score	Total Score
	(c)	(i) Yes	1	
		(ii) No, because $p * q = q$, $q * p = p$ $\Rightarrow p * q \neq q * p$	1	2
		$\therefore$ * is not Commutative		
4	(a)	(ii) $\frac{-\pi}{3}$	1	1
	(b)	$\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$	1	
		$\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{2}{11} = \tan^{-1}\left(\frac{\frac{1}{2}+\frac{2}{11}}{1-\frac{1}{2}\times\frac{2}{11}}\right)$	1	3
		$= \tan^{-1}\left(\frac{15}{20}\right) = \tan^{-1}\left(\frac{3}{4}\right)$	1	
5	(a)	$\frac{dx}{d\theta} = -2a\cos\theta \cdot \sin\theta$	1	
		$\frac{dy}{d\theta} = 2b\sin\theta\cos\theta$	1	
		$\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta}$	1/2	3
		$= \frac{2b\sin\theta\cos\theta}{-2a\cos\theta\sin\theta}$	1/2	
		$= \frac{-b}{a}$		
	(b)	$y = e^x \sin x$		
		$\frac{dy}{dx} = e^x \cdot \cos x + \sin x \cdot e^x = e^x[\cos x + \sin x]$	1	
		$\frac{d^2y}{dx^2} = e^x[-\sin x + \cos x] + [\cos x + \sin x]e^x$ $= e^x[-\sin x + \cos x + \cos x + \sin x]$ $= e^x[2\cos x] = 2 \cdot e^x \cos x$	2	3

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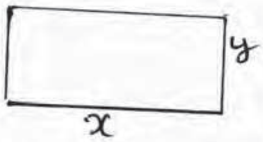
4

6

Remark

formula give 1 score

Qn.No		Scoring Indicators	Split Score	Total Score
6	(a)	(ii) -1	1	1
	(b)	$f(x) = 2x^3 - 24x + 25$		
		$f'(x) = 6x^2 - 24$	1	
		$f'(x) = 0$	$1/2$	
		$x^2 = 4 \Rightarrow x = \pm 2$	$1/2$	4
		$\therefore$ The intervals are $(-\infty, -2), (-2, 2), (2, \infty)$	1	
		$\therefore f(x)$ is increasing in $(-\infty, -2) \cup (2, \infty)$	$1/2$	
		$f(x)$ is decreasing in $(-2, 2)$	$1/2$	
		OR		
	(a)	(iii) $10\pi\ cm^2/cm$	1	1
	(b)			
		Area $A = xy$	$1/2$	
		$\therefore y = \frac{A}{x}$		
		Perimeter $P = 2x + 2y$	$1/2$	
		$P = 2x + 2\frac{A}{x}$		
		$\frac{dP}{dx} = 2 - \frac{2A}{x^2}$	$1/2$	
		$\frac{dP}{dx} = 0$	$1/2$	
		$\Rightarrow x^2 = A \quad \therefore x = \pm\sqrt{A}$	$1/2$	
		$\frac{d^2P}{dx^2} = \frac{4A}{x^3}$	$1/2$	

(5)

OR

Qn.No		Scoring Indicators	Split Score	Total Score
		at $x=\sqrt{A}$, $\frac{d^2P}{dx^2}$ is +ve ∴ the perimeter of the rectangle is least when $x=y=\sqrt{A}$ Hence the perimeter of the rectangle is least when it is a square	1/2 1/2	4
7	(a)	$\int \cot x \log \sin x \, dx$ Let $\log \sin x = t$ $\frac{1}{\sin x} \cos x = \frac{dt}{dx}$ $dt = \cot x \, dx$ $\int \cot x \cdot \log \sin x \, dx = \int t \cdot dt = \frac{t^2}{2} + c$ $= \frac{(\log \sin x)^2}{2} + c$ **Remark** Any other method give full score	1/2 1/2 1	2
	(b)	$\int \frac{1}{x^2+2x+2} dx = \int \frac{1}{(x+1)^2+1^2} dx$ $= \tan^{-1}(x+1) + C$ **Remark** formula geve 1 score	1 1	2

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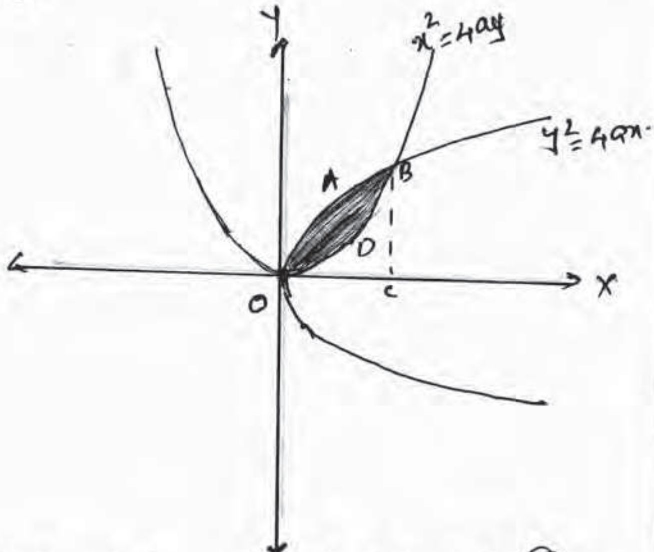
Qn.No		Scoring Indicators	Split Score	Total Score	
	(c)	$\int x \cdot e^{9x} dx = x \cdot \frac{e^{9x}}{9} - \int 1 \cdot \frac{e^{9x}}{9} dx$	1	2	6
		$= \frac{x e^{9x}}{9} - \frac{1}{81} e^{9x} + C$	1		
		$= \frac{1}{81} e^{9x} (9x-1) + C$			
		Remark Formula give ½ score			
8	(a)	(iv) Not defined	1	1	6
	(b)	$\frac{dy}{dx} + 2y\tan x = \sin x$	1		
		$\frac{dy}{dx} + Py = Q$ where $P = 2\tan x, Q = \sin x$	1		
		$I \cdot F = e^{\int P dx}$	½		
		$= e^{\int 2\tan x \, dx} = \sec^2 x$	½	5	
		General Solution $y(IF) = \int Q(IF) dx + C$ $y \sec^2 x = \int \sin x \cdot \frac{1}{\cos x} dx + C$	1		
		$y \sec^2 x = \sec x + C$	1		
		Put $y = 0$ and $x = \frac{\pi}{3}$, Then $C = -2$ $y = \cos x - 2\cos^2 x$	1		
9	(a)	(ii) 0	1	1	3
	(b)	$\vec{a} \times \vec{b} = 5\hat{i} + \hat{j} - 4\hat{k}$	1		
		Area of parallelogram $= \lvert \vec{a} \times \vec{b} \rvert$	½	2	
		$\lvert \vec{a} \times \vec{b} \rvert = \sqrt{42}$	½		

SECOND YEAR HIGHER SECONDARY SAY/IMP. EXAMINATION, JUNE 2016.
(Finalised Scheme of Valuation)

Subject: Computer Science | **Code No: 2019**

Qn.No		Scoring Indicators	Split Score	Total Score
10		Let $I = \int_0^\pi \frac{x}{1+\sin x}\,dx \longrightarrow ①$		
		Also $I = \int_0^\pi \frac{\pi - x}{1+\sin(\pi - x)} = \int_0^\pi \frac{\pi - x}{1+\sin x}\,dx \to ②$	1	
		①+② $2I = \int_0^\pi \frac{\pi}{1+\sin x}\,dx = \pi \int_0^\pi \frac{1}{1+\sin x}\,dx$	1	4
		$2I = \pi \int_0^\pi \frac{(1-\sin x)}{(1+\sin x)(1-\sin x)}\,dx = \pi \int_0^\pi \frac{1-\sin x}{1-\sin^2 x}\,dx$		4
		$= \pi \int_0^\pi \sec^2 x\,dx - \pi \int_0^\pi \sec x \tan x\,dx$	1	
		$2I = [\pi \tan x - \pi \sec x]_0^\pi$		
		$2I = \pi [\tan x - \sec x]_0^\pi$	1	
		$2I = 2\pi$		
		$\therefore I = \pi$		
		Remark write $\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$ give one score		
		OR		OR
		$\int_a^b f(x)\,dx = (b-a) \lim_{n\to\infty} \frac{1}{n}\left[f(a) + f(a+h) + \dots + f(a+(n-1)h)\right]$	1	
		$\int_0^2 e^x\,dx = (2-0) \lim_{n\to\infty} \frac{1}{n}\left[f(0) + f(h) + f(2h) + \dots + f[(n-1)h]\right]$	1/2	

Qn.No		Scoring Indicators	Split Score	Total Score
		$=2\lim\limits_{n\to\infty}\frac{1}{n}\left[1+e^{h}+e^{2h}+\cdots+e^{(n-1)h}\right]$		
		$=2\lim\limits_{n\to\infty}\frac{1}{n}\left[\frac{(e^{h})^{n}-1}{e^{h}-1}\right]$		
		$=2\lim\limits_{n\to\infty}\frac{1}{n}\left[\frac{e^{nh}-1}{e^{h}-1}\right]$	1	4
		$=2(e^{2}-1)\lim\limits_{h\to 0}\frac{h}{2(e^{h}-1)}$		
		$=(e^{2}-1)\lim\limits_{h\to 0}\frac{1}{\left(\frac{e^{h}-1}{h}\right)}$	1	
		$=(e^{2}-1)\times 1=e^{2}-1$	1/2	
		Remark Direct method give one score		
11	(a)	(iii) 2	1	1
			1	
		$x^2=4ay \to ①$ $y^2=4ax \to ②$		
		from ① $y=\frac{x^2}{4a}$ ② $\Rightarrow \frac{x^4}{16a^2}=4ax$	1	

④

$\Rightarrow x=0$ or $x=4a$

Qn.No		Scoring Indicators	Split Score	Total Score
		when $x=0, y=0$ when $x=4a, y=4a$ Required area = Area under the region OAB from $x=0$ to $x=4a$ — Area under the region ODB	1	5
		$= \int_0^{4a} 2\sqrt{a}\sqrt{x}\,dx - \int_0^{4a} \frac{x^2}{4a}\,dx$	1	
		$= \frac{4}{3}\sqrt{a}\left[(4a)^{3/2} - 0\right] - \frac{1}{12a}\left[(4a)^3 - 0\right]$	1/2	
		$= \frac{4}{3}\sqrt{a}\cdot 8a^{3/2} - \frac{1}{12a}\cdot 64a^3$		
		$= \frac{16}{3}a^2$ square unit	1/2	
12	(a)	(iv) $2(\vec{a}\times\vec{b})$	1	1
	(b)	$(\vec{a}\times\vec{b})^2 = (\vec{a}\times\vec{b})\cdot(\vec{a}\times\vec{b}) = a^2b^2\sin^2\theta$	1/2	2
		$= a^2b^2 - a^2b^2\cos^2\theta$	1	
		$= (\vec{a}\cdot\vec{a})(\vec{b}\cdot\vec{b}) - (\vec{a}\cdot\vec{b})^2$		
		$= \begin{vmatrix} \vec{a}\cdot\vec{a} & \vec{a}\cdot\vec{b} \\ \vec{a}\cdot\vec{b} & \vec{b}\cdot\vec{b} \end{vmatrix}$	1/2	
	(c)	$\vec{AB} = \hat{i}+4\hat{j}-4\hat{k}$	1/2	2
		$\vec{AC} = 2\hat{i}+8\hat{j}-8\hat{k} = 2(\hat{i}+4\hat{j}-4\hat{k})$	1/2	
		$\vec{AC} = 2\vec{AB}$	1/2	
		$\Rightarrow$ A, B, C are collinear	1/2	

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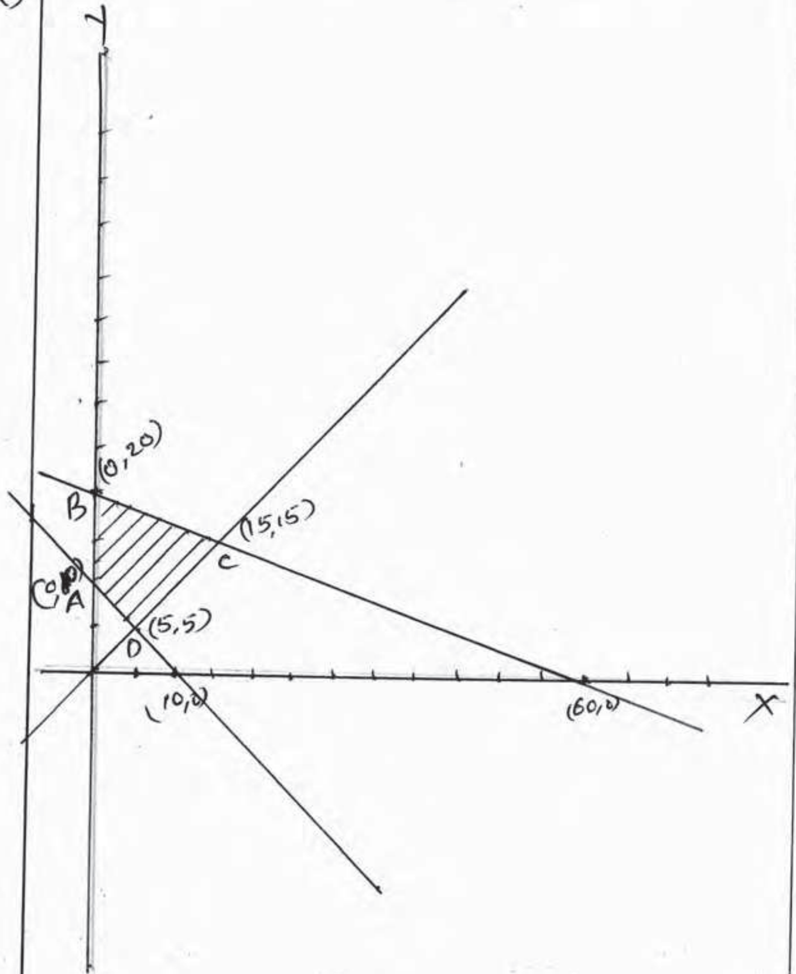
Qn.No	Scoring Indicators	Split Score	Total Score	
13	(a) (iv) $\hat{i}+2\hat{j}+3\hat{k}+\lambda(3\hat{i}+2\hat{j}-2\hat{k})$	1	1	
	(b) $\cos\theta = \left\lvert \frac{\vec{b_1}\cdot\vec{b_2}}{\lvert\vec{b_1}\rvert\lvert\vec{b_2}\rvert} \right\rvert$	1		
	$\vec{b_1}\cdot\vec{b_2} = 19$	1/2	3	4
	$\lvert\vec{b_1}\rvert = 7$, $\lvert\vec{b_2}\rvert = 3$	1/2		
	$\therefore \cos\theta = \frac{19}{21}$	1		
	$\therefore \theta = \cos^{-1}\left(\frac{19}{21}\right)$			
14	(a) (iii) $\frac{4}{\sqrt{3}}$ units	1	1	
	(b) Eqn. of the plane passing through $(1,0,-2)$ is $a(x-1)+b(y-0)+c(z+2)=0 \rightarrow ①$	1		
	Plane ① is ⊥er to the given planes $\Rightarrow 2a+b-c=0 \rightarrow ②$	1/2		
	$a-b-c=0 \rightarrow ③$	1/2		
	Solving ② and ③ we get $\frac{a}{-2}=\frac{b}{1}=\frac{c}{-3}=k$		3	4
	$a=-2k$, $b=k$, $c=-3k$	1/2		
	$\therefore ① \Rightarrow -2x+y-3z-4=0$ $\Rightarrow 2x-y+3z+4=0$	1/2		
	Remark Any other method give full score			

Qn.No	Scoring Indicators	Split Score	Total Score
15	(a) 	3	6
	(b) Corner points are A (0,10), B (0,20), C (15,15) & D (5,5) Remark (a) Incorrect fesible region deduct 1/2 score for each line give one score (b) Any correct three corner points give full score	3	

Qn.No	Scoring Indicators	Split Score	Total Score	
16	(a) (iii) $\frac{4}{9}$	1	1	
	(b) (i) $P(A)=1/2$ $\quad P(B)=1/3$	$1/2$		
	$P(A')=1/2$ $\quad P(B')=2/3$	$1/2$		
	P[the problem is solved]		2	
	$=1-P$[none of them solve the problem]	$1/2$		
	$=1-P[A'\cap B'] = 1-P(A')\cdot P(B')$	$1/2$		5
	$=1-(\frac{1}{2}\times\frac{2}{3}) = 1-\frac{1}{3} = \frac{2}{3}$			
	(ii) P[exactly one of them solved the problem]			
	$=P(A'\cap B \cup A\cap B') = P(A'\cap B)+P(A\cap B')$	$1/2$		
	$=P(A')\cdot P(B)+P(A)\cdot P(B')$	$1/2$	2	OR
	$=\frac{1}{2}\cdot\frac{1}{3}+\frac{1}{2}\cdot\frac{2}{3}$			
	$=\frac{1}{6}+\frac{2}{6}$	1		
	$=\frac{1}{2}$			
	OR			
	(i) $P(\text{success}) = \frac{3}{6} = \frac{1}{2}$ $\quad P(\text{failure}) = 1-1/2 = 1/2$	$1/2+1/2$	1	
	(ii) $P(5\text{ success}) = nC_x\, p^x q^{n-x}$	1		
	$= 6C_1 (1/2)^5 (1/2) = \frac{3}{32}$	1	2	5
	(iii) $P(\text{at least 5 success}) = P(5\text{ success}) + P(6\text{ success})$	$1/2$		
	$= 6(1/2)^5(1/2) + 1(1/2)^6 = \frac{3}{32}+\frac{1}{64} = \frac{7}{64}$	$1\frac{1}{2}$	2	