SECOND YEAR HIGHER SECONDARY EXAMINATION, JUNE 2017
(Finalised Scheme of Valuation)

Subject: Mathematics (Science) **Code No: 7018**

Qn.No	Scoring Indicators	Split Score	Total Score
1(a)	(d) Equivalence relation	1	1
(b)	$2 * (3 * 4) = 2 * 10$	1/2	
	$= 14$	1/2	2
	$(2 * 3) * 4 = 7 * 4$	1/2	
	$= 18$	1/2	
	Remark:- Give full score for direct answer		
(c)	$f: R \to R$, $g: R \to R$ If $x_1, x_2 \in R$.		
	$(g \circ f)(x_1) = (g \circ f)(x_2) \Rightarrow$	1	
	$g(f(x_1)) = g(f(x_2)) \Rightarrow f(x_1) = f(x_2)$	1/2	2
	$\Rightarrow x_1 = x_2$	1/2	
	Remark:- If answer is "Yes" or "one-one" give one score		
2(a)	(a) $\frac{1}{\sqrt{2}}$	1	1
(b)	$1 + \sin x = \cos^2 x/2 + \sin^2 x/2 + 2 \sin x/2 \cos x/2$ $= [\cos x/2 + \sin x/2]^2$	1/2	
	$\therefore \sqrt{1+\sin x} = \cos x/2 + \sin x/2$		
	$\sqrt{1-\sin x} = \cos x/2 - \sin x/2$	1/2	

5

SECOND YEAR HIGHER SECONDARY EXAMINATION, JUNE 2017

Qn. No	Sub Qns	Answer Key / Value points	Score	Total
		$= \cot^{-1}\left[\frac{\cos x/2 + \sin x/2 + \cos x/2 - \sin x/2}{\cos x/2 + \sin x/2 - (\cos x/2 - \sin x/2)}\right]$	1	
		$= \cot^{-1}\left[\frac{2\cos x/2}{2\sin x/2}\right]$	1/2	3
		$= \cot^{-1}\left[\cot x/2\right] = x/2$	1/2	
		Remark: Any other alternate method give full score		
3(a)		(C) 16	1	1
	(b)	$\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$	1/2	
		$\Rightarrow \pm 10 = \frac{1}{2}\begin{vmatrix} K & 0 & 1 \\ 5 & 0 & 1 \\ 0 & 1 & 1 \end{vmatrix}$	1/2	2
		$\Rightarrow K = 25$ or -15	1	
		Remark:- Only one correct value of K give full score		
	(c)	$A = IA$	1/2	
		$\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} A \quad R_1 \leftrightarrow R_2$	1/2	
		$\begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} A$		

4

SECOND YEAR HIGHER SECONDARY EXAMINATION, JUNE 2017

Qn. No	Sub Qns	Answer Key / Value points	Score	Total
		$\begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 1 & -2 \end{bmatrix} A \quad R_2 \to R_2 - 2R_1$	1	
		$\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix} A \quad R_2 \to (-1) R_2$		3
		$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix} A \quad R_1 \to R_1 - R_2$	1	
		$\therefore A^{-1} = \begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$		
		<u>Remark</u>:- Give full score for using column transformations		
4(a)		(a) 5	1	
	(b)	$AX = B$	1/2	
		$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 3 & -1 \\ 1 & -1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 6 \\ -1 \end{bmatrix} \quad X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$		
		$\|A\| = -6$	1/2	
		$A^{-1} = \dfrac{adj\, A}{\|A\|}$		

6

SECOND YEAR HIGHER SECONDARY EXAMINATION, JUNE 2017

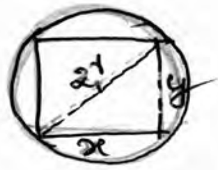
Qn. No	Sub Qns	Answer Key / Value points	Score	Total
		$\text{adj}A = \begin{bmatrix} 2 & -2 & -4 \\ -3 & 0 & 3 \\ -5 & 2 & 1 \end{bmatrix}$	$1\frac{1}{2}$	
		$X = A^{-1}B$	$\frac{1}{2}$	
		$= \dfrac{\begin{bmatrix} 2 & -2 & -4 \\ -3 & 0 & 3 \\ -5 & 2 & 1 \end{bmatrix}}{-6}\begin{bmatrix} 1 \\ 6 \\ -1 \end{bmatrix}$	$\frac{1}{2}$	4 (5)
		$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{-1}{6}\begin{bmatrix} -6 \\ -6 \\ 6 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}$	$\frac{1}{2}$	
		$x = 1,\ y = 1,\ z = -1$		
		Remark Any correct six entries in adj A give 1 mark		
5(a)		$\underset{x \to 1^-}{Lt} f(x) = 6$	1	
		$\underset{x \to 1^+}{Lt} f(x) = -4$	1	2
		$LHL \neq RHL$ $\therefore f(x)$ is not continuous		
		Remark 1. for direct answer give $\frac{1}{2}$ score 2. for concept of continuity give 1 score		

SECOND YEAR HIGHER SECONDARY EXAMINATION, JUNE 2017

Qn. No	Sub Qns	Answer Ke. y / Value points	Score	Total
(b)		$\frac{dx}{dt} = a^{\sin^{-1}t} \times \frac{1}{\sqrt{1-t^2}} \times \log a$ $\frac{dy}{dt} = a^{\cos^{-1}t} \times \frac{-1}{\sqrt{1-t^2}} \times \log a$	$1\frac{1}{2}$	2
		$\frac{dy}{dx} = \frac{dy}{dt} \Big/ \frac{dx}{dt} = \frac{-y}{x}$	$\frac{1}{2}$	
		Remark:- 1. for alternate method give full score 2. for formula only give ½ score		(6)
(c)		$\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$	1	
		$\sqrt{1-x^2} \times \frac{dy}{dx} = 1$		
		$\sqrt{1-x^2}\ \frac{d^2y}{dx^2} + \frac{dy}{dx} \times \frac{1 \times (-2x)}{2\sqrt{1-x^2}} = 0$	$\frac{1}{2}$	2
		$(1-x^2)\ \frac{d^2y}{dx^2} = x\frac{dy}{dx}$	$\frac{1}{2}$	
		Remark:- for $\frac{d^2y}{dx^2}$ give ½ score		

$\frac{6}{13}$

SECOND YEAR HIGHER SECONDARY EXAMINATION, JUNE 2017

Qn. No	Sub Qns	Answer Key / Value points	Score	Total
6(a)		(c) 20	1	1
(b)			½	
		$x^2 + y^2 = 4r^2$	½	
		Area $A = x\sqrt{4r^2 - x^2}$	½	
		$\frac{dA}{dx} = \frac{4r^2 - 2x^2}{\sqrt{4r^2 - x^2}}$	1	4
		$\frac{dA}{dx} = 0 \implies x = \sqrt{2}\, r$	½	
		$\frac{d^2A}{dx^2} < 0$, A is maximum	½	
		$x = \sqrt{2}\, r,\ y = \sqrt{2}\, r$	½	
		OR		
(a)		(c) $1/e$	1	
(b)		$(255)^{1/4} = [256 + (-1)]^{1/4}$	1	
		$y = x^{1/4},\ \Delta x = -1$	1	4
		$\Delta y = \frac{1}{4} x^{-3/4} \times \Delta x = \frac{-1}{256}$	1	
		$(256)^{1/4} = 4 - \frac{1}{256} = 3.9961$	1	

5

OR 5

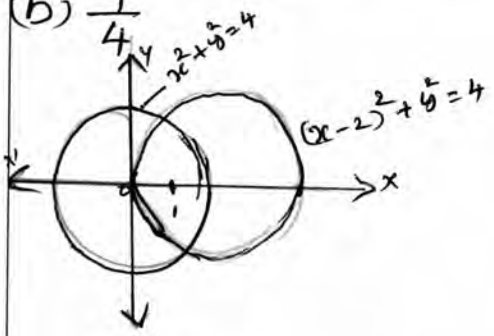
7/13

SECOND YEAR HIGHER SECONDARY EXAMINATION, JUNE 2017

Qn. No	Sub Qns	Answer Ke y / Value points	Score	Total
7 (a)		$\int \frac{(4x-10)dx}{\sqrt{(x-2)(x-3)}} = 2\int \frac{(2x-5)}{\sqrt{x^2-5x+6}}dx$	1	
		put $t = x^2-5x+6$ $= 2\int \frac{1}{\sqrt{t}}dt$	1	3
		$= 4\sqrt{x^2-5x+6} + c$	1	
(b)		$\frac{1}{(x^2+1)(x^2+4)} = \frac{A}{x^2+1} + \frac{B}{x^2+4}$	1	6
		$1 = A(x^2+4) + B(x^2+1)$, $A = 1/3$ $B = -1/3$	1	3
		$\int \frac{1}{(x^2+1)(x^2+4)}dx = \frac{1}{3}\int\frac{1}{x^2+1}dx - \frac{1}{3}\int\frac{1}{x^2+4}dx$		
		$= \frac{1}{3}\left[\tan^{-1}x - \frac{1}{2}\tan^{-1}x/2\right] + c$	1	
8		$\int_0^{\pi/4} \log(1+\tan x)dx = \int_0^{\pi/4}\log[1+\tan(\pi/4 - x)]dx$	1	
		$= \int_0^{\pi/4}\log\left(\frac{2}{1+\tan x}\right)dx$	1	4
		$= \log 2\int_0^{\pi/4}dx - \int_0^{\pi/4}\log(1+\tan x)dx$	1	4
		$\int_0^{\pi/4}\log(1+\tan x)dx = \frac{\pi}{8}\log 2$	1	
		Remark:- Any related formula give 1 score		

8/13

SECOND YEAR HIGHER SECONDARY EXAMINATION, JUNE 2017

Qn. No	Sub Qns	Answer Key / Value points	Score	Total
		OR		
		$\int_0^1 e^x dx = \lim_{n\to\infty} \frac{1}{n}\left[e^0 + e^{1/n} + e^{2/n} + \cdots + e^{\frac{n-1}{n}}\right]$	1	
		$= \lim_{n\to\infty} \frac{1}{n}\left[\frac{e^{n/n}-1}{e^{1/n}-1}\right]$	1	4
		$= (e-1) \lim_{n\to\infty}\left[\frac{e^{1/n}-1}{1/n}\right]^{-1}$	1	
		$= e-1$	1	
		Remark:- 1. For direct answer give 1 score 2. Any related formula give 1 score 3. Any alternate method give full score		
9 (a)		(b) $\frac{9}{4}$	1	
(b)			1	
		x coordinate of point of intersection is 1	1	
		Area $= 2\int_0^1 \sqrt{4-(x-2)^2}\,dx + \int_1^2 \sqrt{4-x^2}\,dx$	1	

OR (4)

Qn. No	Sub Qns	Answer Key / Value points	Score	Total
		$= \left[(x-2)\sqrt{4-(x-2)^2} + 4\sin^{-1}\left(\frac{x-2}{2}\right)\right]_0^1 +$ $\left[x\sqrt{4-x^2} + 4\sin^{-1} x/2\right]_1^2$	1/2	
		$= \left[-\sqrt{3} + 4\sin^{-1}\left(-\frac{1}{2}\right) - 4\sin^{-1}(-1)\right] +$ $\left[4\sin^{-1}(1) - \sqrt{3} - 4\sin^{-1}\frac{1}{2}\right]$	1/2	
		$= \left[-\sqrt{3} - 4\times\frac{\pi}{6} + 4\times\frac{\pi}{2}\right] +$ $\left[4\times\frac{\pi}{2} - \sqrt{3} - 4\times\frac{\pi}{6}\right]$	1/2	5 (6)
		$= \left(-\sqrt{3} - \frac{2\pi}{3} + 2\pi\right) + \left(2\pi - \sqrt{3} - \frac{2\pi}{3}\right)$		
		$= \frac{8\pi}{3} - 2\sqrt{3}$	1/2	
		Remark Give 1 score for formula $\int\sqrt{a^2-x^2}\,dx$		

13

SECOND YEAR HIGHER SECONDARY EXAMINATION, JUNE 2017

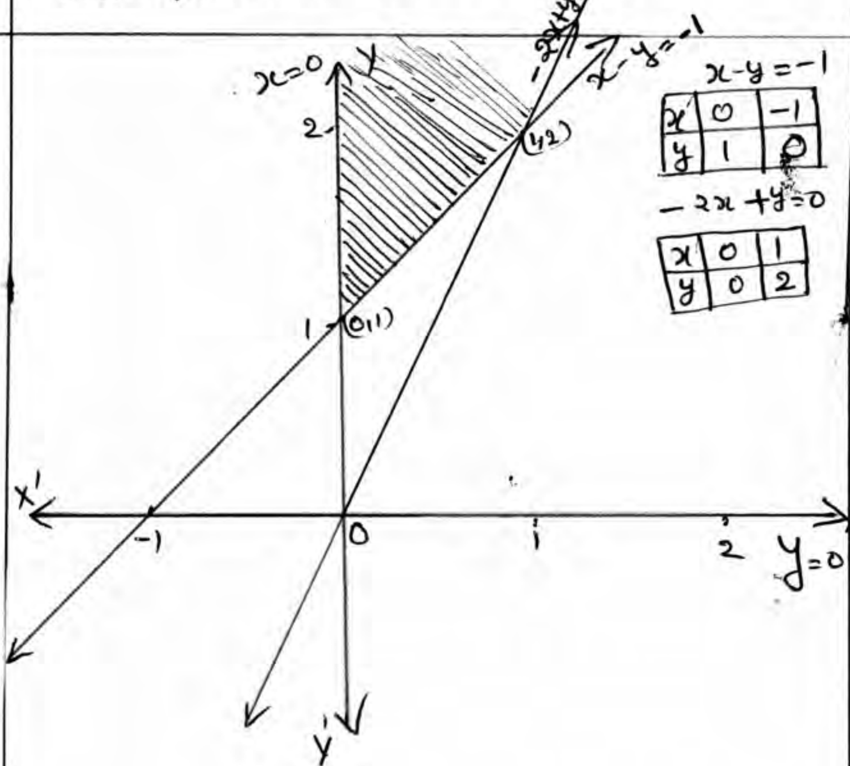
Qn. No	Sub Qns	Answer Ke y / Value points	Score	Total
10 (a)		(d) 1	1	
(b)		$\frac{dx}{dy} + \frac{1}{1+y^2}x = \frac{1}{1+y^2} e^{-\tan^{-1}y}$	1	
		Integrating factor $= e^{\int p\,dy}$	1/2	
		for writting P and Q	1/2	(6)
		$IF = e^{\int \frac{1}{1+y^2} dy}$	1/2	5
		$= e^{\tan^{-1}y}$	1/2	
		Solution is $x \cdot e^{\tan^{-1}y} = \int \frac{1}{1+y^2} e^{-\tan^{-1}y} \times e^{\tan^{-1}y} dy$	1	
		$x e^{\tan^{-1}y} = \tan^{-1}y + C$	1	
11 (a)		(C) 4	1	1
(b)		$\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 3 & 0 \\ 0 & 3 & 1 \end{vmatrix}$	1/2	(3)
		$= 3\hat{i} - \hat{j} + 3\hat{k}$	1/2	
		$\lvert \vec{a} \times \vec{b} \rvert = \sqrt{19}$	1/2	2
		Unit vector perpendicular to $\vec{a}$ and $\vec{b}$ is $\frac{\vec{a}\times\vec{b}}{\lvert\vec{a}\times\vec{b}\rvert} = \frac{3\hat{i} - \hat{j} + 3\hat{k}}{\sqrt{19}}$	1/2	

Remark:- For Formula give 1/2 score

Second Year Higher Secondary Examination June 2017

Qn.No	Sub Qn.	Answer Key / value Points	Score	Total	
12(a)		(a) 1/3	1	1	
(b)		$\vec{a}\cdot(\vec{b}+\vec{c})=0$ $\vec{b}\cdot(\vec{a}+\vec{c})=0$ $\vec{c}\cdot(\vec{a}+\vec{b})=0$	1		
		$2(\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a})=0$	1/2	4	5
		$\lvert\vec{a}+\vec{b}+\vec{c}\rvert^2=\lvert\vec{a}\rvert^2+\lvert\vec{b}\rvert^2+\lvert\vec{c}\rvert^2+2(\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a})$	1		
		$=9+16+16+0$	1		
		$\lvert\vec{a}+\vec{b}+\vec{c}\rvert=\sqrt{41}$	1/2		
13(a)		(b) $4x-z=7$	1	1	
(b)		$\vec{a_2}-\vec{a_1}=\hat{j}-4\hat{k}$	1/2		
		$\vec{b_1}\times\vec{b_2}=\begin{vmatrix}\hat{i}&\hat{j}&\hat{k}\\-1&-2&-2\\1&-1&-1\end{vmatrix}=-3\hat{j}+3\hat{k}$	1/2		
		$\lvert\vec{b_1}\times\vec{b_2}\rvert=\sqrt{18}$		3	4
		$s.d=\left\lvert\dfrac{(\vec{a_2}-\vec{a_1})\cdot(\vec{b_1}\times\vec{b_2})}{\lvert\vec{b_1}\times\vec{b_2}\rvert}\right\rvert$	1		
		$=\left\lvert\dfrac{(\hat{j}-4\hat{k})\cdot(-3\hat{j}+3\hat{k})}{\sqrt{18}}\right\rvert$	1/2		
		$=\left\lvert\dfrac{-3-12}{\sqrt{18}}\right\rvert=\dfrac{15}{\sqrt{18}}=\dfrac{5}{\sqrt{2}}$	1/2		
		<u>Remark</u> write $\vec{a_1},\vec{a_2},\vec{b_1},\vec{b_2}$ give 1 score			

Second Year Higher Secondary Examination June 2017 (12/13)

Qn No	Sub Qn	Answer Key / Value Points	Score	Total
14(a)		(b) $\frac{1}{3}$	1	1
(b)		$\frac{x-1}{a} = \frac{y-2}{b} = \frac{z+4}{c}$	1	
		$2a - b + c = 0$	1/2	3
		$a + b + c = 0$	1/2	
		$a : b : c = 2 : 1 : -3$	1	
		Remark 1. Give 1/2 score for $\frac{x-x_1}{a} = \frac{y-y_1}{b} = \frac{z-z_1}{c}$ 2. Give 1/2 score for $a_1a_2+b_1b_2+c_1c_2=0$		(4)
15(a)			1/2 2 1/2	3
(b)		The corner points are (0,1) and (1,2)	2	2
(c)		There is no maximum point	1	1
		Remark (c) for attempting give full score		(6)

Qn. No.	Sub Qn.	Answer Key / Value points	Score	Total
16	(a)	$3/4$	1	1
	(b)	E : event that man reports "six occurs"		
		S_1, S_2 : events that six occurs and does not occur respectively	1	
		(i) $P(E) = P(E/S_1) \times P(S_1) + P(E/S_2) \times P(S_2)$		2
		$= \frac{3}{4} \times \frac{1}{6} + \frac{1}{4} \times \frac{5}{6}$	1	
		(ii) $P(S_1/E) = \dfrac{P(S_1) \times P(E/S_1)}{P(S_1) \times P(E/S_1) + P(S_2) \times P(E/S_2)}$	1	
		$= \dfrac{\frac{1}{6} \times \frac{3}{4}}{\frac{1}{6} \times \frac{3}{4} + \frac{5}{6} \times \frac{1}{4}}$	1	2
		$= \frac{1}{8} \times \frac{24}{8} = \frac{3}{8}$		
		OR		(5)
	(a)	$\Sigma p_i = 1$		
		$0.1 + K + 2K + 2K + K = 1$	½	
		$6K + 0.1 = 1$		1
		$6K = 0.9$		
		$K = \frac{3}{20}$	½	
	(b)	P(He studies at least two hours) $= P(X \geq 2)$	1	OR (5)
		$P(X \geq 2) = P(X=2) + P(X=3) + P(X=4)$	1	
		$= 2 \times \frac{3}{20} + 2 \times \frac{3}{20} + \frac{3}{20}$	1	4
		$= \frac{6}{20} + \frac{6}{20} + \frac{3}{20} = \frac{15}{20} = \frac{3}{4}$	1	

1. FRANCIS. P.S ST. MARY'S HS VIZHINJAM 9447586911 21/6/17
2. N. SASI KUMAR. Govt HSS Vechoochira Colony. 21/6/2017
3. Usha. B Usha BHSS Karunagappally 21/6/17
4. SHAMSUDEEN. K Govt Girls HSS. Perinthalmanna 21/6/17
5. Anandakumar MK SHMGVHSS, Edavanna 21/6/17
6. FRAGGY P JOSEPH, Kadavathur VHSS Kannur 21/6/17
7. Prakash. K HSS Vallapuzha Palakkad 21/6/17
8. Abdul Gafoor K JDTI Islam VHSS
9. George K A St. Antony's HSS Pudukkad
10. Anithakumari. V GVHSS Kunnamkulam Anitha
11. Sreelatha. M KRGPM VHSS, Odanavattom
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