ANSWER KEY

Second YEAR HIGHER SECONDARY EXAMINATION MARCH 2026

PART-I/II/III

SUBJECT: Mathematics - Com - 60

CODE NO: SY 251

VERSION:

60 SCORES

2 HOURS

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1.	(i)	$3 - x^2 = 3 - 8 \Rightarrow x = \pm 2\sqrt{6}$	½ + ½	3
	(ii)	$\begin{vmatrix} x & y & 1 \\ 1 & 3 & 1 \\ 2 & 4 & 1 \end{vmatrix} = 0$	1	
		$x(3-4) - y(1-2) + 1(4-6) = 0$	1	
		$\therefore x - y + 2 = 0$		
2.		$\lim_{x \to 2^-} 2x + 3 = 7$	1	3
		$\lim_{x \to 2^+} 2x - 3 = 1$	1	
		Not continuous at $x = 2$	1	
3.	(i)	2×2	1	3
	(ii)	$2x - y = 10$, $3x + y = 5$ OR $\begin{bmatrix} 2x \\ 3x \end{bmatrix} + \begin{bmatrix} -y \\ y \end{bmatrix} = \begin{bmatrix} 10 \\ 5 \end{bmatrix}$	1+1	
		$5x = 15$		
		$x = 3 \quad \therefore y = -4$		
4.	(i)	(a) $(0, \pi/2)$	1	3
	(ii)	$f'(x) = 2x - 4$, $f'(x) = 0 \Rightarrow x = 2$	½	
		Consider intervals $(-\infty, 2)$, $(2, \infty)$	½	
		$f'(0) = -4 < 0 \quad \therefore f$ is decreasing on $(-\infty, 2)$	½	
		$f'(3) = 2 > 0 \quad \therefore f$ is increasing on $(2, \infty)$	½	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
5.	(i)	$a = -1$, $b = 2$	1	
	(ii)	$A^T = \begin{bmatrix} 2 & 4 \\ 6 & -8 \end{bmatrix}$	$\frac{1}{2}$	
		$A + A^T = \begin{bmatrix} 2 & 6 \\ 4 & -8 \end{bmatrix} + \begin{bmatrix} 2 & 4 \\ 6 & -8 \end{bmatrix} = \begin{bmatrix} 4 & 10 \\ 10 & -16 \end{bmatrix}$	1	3
		$(A + A^T)^T = \begin{bmatrix} 4 & 10 \\ 10 & -16 \end{bmatrix} = A + A^T$	$\frac{1}{2}$	
		$\therefore A + A^T$ is a Symmetric matrix.		
		Remark i) $A' = -A$ give ½ score		
6.	(i)	$\int \frac{1}{x}\, dx = \log\lvert x\rvert + c$.	1	
	(ii)	$\sin x + \cos x = t$	½	
		$(\cos x - \sin x)\, dx = dt$	½	3
		$\int \frac{1}{t}\, dt = \log\lvert t\rvert + c$	1	
		$= \log\lvert \sin x + \cos x\rvert + c$.		
7.	(i)	$P(A) \cdot P(B)$.	1	
	(ii)	$P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{4/13}{9/13} = 4/9$	2	3
		Remark: for formula of $P(A/B)$ give 1 score		
8	(i)	0	1	
	(ii)	$I = \int_0^a \frac{\sqrt{x}}{\sqrt{x} + \sqrt{a-x}}\, dx$ — (1)	½	
		$I = \int_0^a \frac{\sqrt{a-x}}{\sqrt{a-x} + \sqrt{x}}\, dx$ — (2)	½	3
		$2I = \int_0^a 1\, dx = [x]_0^a = a$	½	
		$I = a/2$	½	
9.	(i)	$\frac{1}{2} \in R$, $(\frac{1}{2}, \frac{1}{2}) \notin R$ $\therefore$ not reflexive.	1	
	(ii)	$f(x_1) = f(x_2) \Rightarrow 1 + x_1^2 = 1 + x_2^2 \not\Rightarrow x_1 = x_2$	1+1	4
		$\therefore$ not one-one		
		Codomain $= R$ Range $= [1, \infty)$	1	
		$\therefore$ Not onto.		
		Remark(i) Example is not necessary		

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10.	(i)	$\sin\left(\frac{\pi}{3}+\frac{\pi}{6}\right)=\sin\left(\frac{\pi}{2}\right)=1$	1 ½ ½	4
	(ii)	put $x=\sin\theta$	1	
		$\sin^{-1}(3\sin\theta-4\sin^3\theta)=\sin^{-1}(\sin 3\theta)$	½	
		$=3\theta=3\sin^{-1}x$.	½	
11.		$\vec{a_1}=-\vec{i}-\vec{j}-\vec{k}$ $\quad \vec{a_2}=3\vec{i}+5\vec{j}+7\vec{k}$	½	4
		$\vec{b_1}=7\vec{i}-6\vec{j}+\vec{k}$ $\quad \vec{b_2}=\vec{i}-2\vec{j}+\vec{k}$	½	
		$\vec{a_2}-\vec{a_1}=4\vec{i}+6\vec{j}+8\vec{k}$	½	
		$\vec{b_1}\times\vec{b_2}=\begin{vmatrix}\vec{i}&\vec{j}&\vec{k}\\7&-6&1\\1&-2&1\end{vmatrix}=-4\vec{i}-6\vec{j}-8\vec{k}$	1	
		$(\vec{a_2}-\vec{a_1})\cdot(\vec{b_1}\times\vec{b_2})=-116$	½	
		$\lvert\vec{b_1}\times\vec{b_2}\rvert=\sqrt{116}$		
		$S.D=\left\lvert\frac{(a_2-a_1)\cdot(b_1\times b_2)}{\lvert b_1\times b_2\rvert}\right\rvert$	1	
		$=\left\lvert\frac{-116}{\sqrt{116}}\right\rvert=\sqrt{116}$.		
12.	1.	Area $=\int_0^3 x^2\,dx=\left[\frac{x^3}{3}\right]_0^3=9$.	1+1	4
	2.	Area $=\int_0^{\pi}\sin x\,dx=\left[-\cos x\right]_0^{\pi}=2$	2	
		Remark i) and ii) for formula give 1 score		
13.		E_1: choose box I, E_3: choose box III	½	
		E_2: choose box II A: getting a gold coin		
		$P(E_3/A)=\frac{P(E_3)\cdot P(A/E_3)}{P(E_1)\cdot P(A/E_1)+P(E_2)\cdot P(A/E_2)+P(E_3)\cdot P(A/E_3)}$	1	
		$P(E_1)=P(E_2)=P(E_3)=\frac{1}{3}$	1	
		$P(A/E_1)=1 \quad P(A/E_2)=0 \quad P(A/E_3)=\frac{1}{2}$	1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$= \frac{\frac{1}{3} \times \frac{1}{2}}{\frac{1}{3}\cdot 1 + \frac{1}{3}\cdot 0 + \frac{1}{3}\times\frac{1}{2}} = \frac{\frac{1}{2}}{1+1/2} = \frac{1}{3}$	1/2	4
14.	(i)	2	1	
	(ii)	$(2-y)\,dy = (x+1)\,dx$.	2	4
		$2y - \frac{y^2}{2} = \frac{x^2}{2} + x + c$.	1	
15.	i.	$\frac{dr}{dt} = .7$ cm/sec.	1/2	
		Circumference of the circle is		
		$P = 2\pi r$	1/2	
		$\frac{dP}{dt} = 2\pi \cdot \frac{dr}{dt}$	1/2	
		$= 2\pi \times .7 = 1.4\pi$ cm/sec.	1/2	
	(ii)	$f'(x) = 3x^2 - 3$.	1/2	
		$f'(x) = 0 \Longrightarrow x = \pm 1$	1/2	4
		$f''(x) = 6x$.		
		$f''(1) = 6 > 0$ $\quad f''(-1) = -6 < 0$	1/2	
		$\therefore x = 1$ is a point of local minimum	1/2	
		$x = -1$ is a point of local maxim.		
		Max value = 5		
		Min. value = 1		
16		$AB = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 6 & 8 \\ 6 & 9 & 12 \end{bmatrix}$	1	
		$(AB)^T = \begin{bmatrix} 2 & 4 & 6 \\ 3 & 6 & 9 \\ 4 & 8 & 12 \end{bmatrix}$ —— (1)	1	4
		$B^T \cdot A^T = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \end{bmatrix} = \begin{bmatrix} 2 & 4 & 6 \\ 3 & 6 & 9 \\ 4 & 8 & 12 \end{bmatrix}$ —(2)	1+1	
		$\therefore (AB)^T = B^T \cdot A^T$		

Q No	Sub Qns	Answer Key/Value Points	Score	Total Score
17.	i.	$\vec{a}+\vec{b} = 1\vec{i}+0\vec{j}+\vec{k}$	1	
		unit vector $\rightarrow \dfrac{\vec{a}+\vec{b}}{\lvert\vec{a}+\vec{b}\rvert} = \dfrac{\vec{i}}{\sqrt{2}} + \dfrac{\vec{k}}{\sqrt{2}}$	½ + ½	
	(ii)	$\vec{a} = 2\vec{i}-\vec{j}+2\vec{k}$ $\vec{b} = \vec{i}+2\vec{j}+0\vec{k}$ $\quad \therefore \vec{a}\cdot\vec{b} = 0$	1	
		Remark: for any vector give 1 score		6
	(iii)	$\vec{a}\times\vec{b} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & -1 & 2 \\ -1 & 1 & -1 \end{vmatrix} = \vec{i}(1-2)-\vec{j}(-2+2)+\vec{k}(2-1)$	1+1	
		$= -\vec{i}+0\vec{j}+\vec{k}$		
		$\lvert\vec{a}\times\vec{b}\rvert = \sqrt{1+1} = \sqrt{2}$.	1	
		Area $= \sqrt{2}$		
		Remark i) for $\dfrac{\vec{a}}{\lvert\vec{a}\rvert}$ give 1 score iii) area $\lvert\vec{a}\times\vec{b}\rvert$ give 1 score		
18.		$\text{adj}(A) = \begin{bmatrix} 7 & 1 & -3 \\ -19 & -1 & 11 \\ -11 & -1 & 7 \end{bmatrix}$ $\quad AX=B$	1	
			1	
		for writing matrices A, X, B	1	
		$\lvert A\rvert = 4$	1	
		$X = A^{-1}B = \dfrac{1}{4}\begin{bmatrix} 7 & 1 & -3 \\ -19 & -1 & 11 \\ -11 & -1 & 7 \end{bmatrix}\begin{bmatrix} 7 \\ -5 \\ 12 \end{bmatrix}$	1	6
		$= \begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix}$	1	

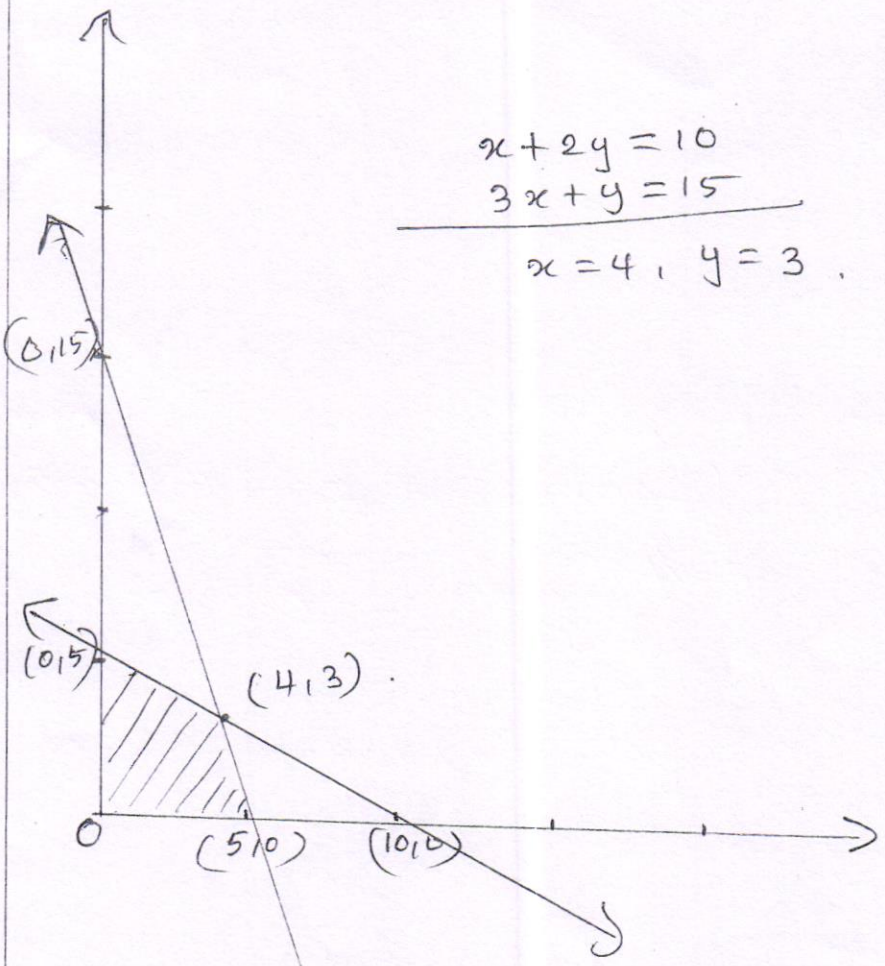
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
19.	(i)	$1 - \frac{dy}{dx} = 0$	1	
		$\frac{dy}{dx} = 1$	1	
	(ii)	$\frac{dy}{dx} = \frac{1}{2\sqrt{\sin(x^2)}} \cdot \cos(x^2) \cdot 2x$	2	
		$= \frac{x \cdot \cos(x^2)}{\sqrt{\sin(x^2)}}$		
				6.
	(iii)	$\frac{dx}{d\theta} = -a\sin\theta$	1/2	
		$\frac{dy}{d\theta} = a\cos\theta$	1/2	
		$\frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}}$	1/2	
		$= \frac{-a\cos\theta}{a\sin\theta}$	1/2	
		$= -\cot\theta$.		

Q No	Sub Qns	Answer Key/Value Points	Score	Total Score
20.		$x+2y=10$	1	

x	0	10
y	5	0

$3x+y=15$

x	0	5
y	15	0



$x+2y=10$
$3x+y=15$

$x=4,\ y=3.$

1

3

6

Corner points	$Z=3x+2y$
(0,0)	$Z=0$
(5,0)	$Z=15$
(4,3)	$Z=18$ ← Maximum.
(0,5)	$Z=10$.

1

Z is maximum at (4,3) and Maximum Value = 18.

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