

ANSWER KEY

SAY/IMP

SECOND YEAR HIGHER SECONDARY EXAMINATION June 2023

PART-III/III

SUBJECT: MATHEMATICS SCIENCE (HI)

CODE NO: S-2265

VERSION: __

60 SCORES2 HOURS

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1.		$f(x_1) = f(x_2) \Rightarrow 2x_1 = 2x_2$ $\Rightarrow x_1 = x_2$ $\therefore f$ is one-one	2 1	3
2.	(a)	$A+B = \begin{bmatrix} 3 & 6 \\ 6 & 9 \end{bmatrix}$	1	
	(b)	$3A-B = \begin{bmatrix} 6 & 12 \\ 9 & 15 \end{bmatrix} - \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ $= \begin{bmatrix} 5 & 10 \\ 6 & 11 \end{bmatrix}$	1 1	3
3.		$3-x^2 = 3-8$ $-x^2 = -8$ $x^2 = 8 \Rightarrow x = \pm 2\sqrt{2}$	2 1	3
4.		$\lim_{x \rightarrow 0} f(x) = \lim_{x \rightarrow 0} (x^2+3) = 3$ $f(0) = 1$ Since $\lim_{x \rightarrow 0} f(x) \neq f(0)$, f is not continuous at $x=0$	1 1 1	3
5.	(a)	$\int \sin x dx = -\cos x$ (iii)	1	
	(b)	$\int e^x dx = e^x$ (iv)	1	
	(c)	$\int 2 dx = 2x$ (i)	1	3

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6.		$y_1 = \cos x$ $y_2 = -\sin x$ $R.S. = \frac{d^2y}{dx^2} + y = -\sin x + \sin x = 0 = R.S$	1 1 1	3
7.		direction cosines are $\cos 90, \cos 30, \cos 45$ i.e. $0, \frac{\sqrt{3}}{2}, \frac{1}{\sqrt{2}}$	1 2	3
8.		$P(A B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A) \cdot P(B A)}{P(B)}$ $= \frac{0.8 \times 0.4}{0.5} = \dots = \frac{16}{25}$	2 1	3
9.	(a)	Since $\sin \pi/6 = 1/2$ $\sin^{-1}(1/2) = \pi/6$ Since $\pi/6 \in [-\pi/4, \pi/4]$, principal value is $\pi/6$	1 1 1	4
10.	(b)	$\pi/3 + \pi/3 = 2\pi/3$ $AB = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix} = \begin{bmatrix} 5+14 & 6+16 \\ 15+28 & 18+32 \end{bmatrix}$ $= \begin{bmatrix} 19 & 22 \\ 43 & 50 \end{bmatrix}$	2	4
11.	(a)	$\frac{dy}{dx} = \cos(ax+b) \cdot \frac{d}{dx}(ax+b)$ $= a \cos(ax+b)$	1 1	
	(b)	$\frac{dx}{dx} + \frac{dy}{dx} = \frac{d}{dx} \pi$ $1 + \frac{dy}{dx} = 0$ $\frac{dy}{dx} = -1$	1 1	4

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12		$f'(x) = \frac{d}{dx} 3x + \frac{d}{dx} 7$ $= 3 \times 1 + 0 = 3 > 0 \quad \forall x \in \mathbb{R}$ <p>f is increasing on \mathbb{R}</p>	1 2 1	4
13.		$\text{area} = \int_2^4 y \, dx$ $= \int_2^4 3\sqrt{x} \, dx$ $= 3 \left[\frac{x^{3/2}}{3/2} \right]_2^4$ $= 2(8 - 2\sqrt{2})$	1 1 1	4
14.		$\int_{-1}^1 (x+1) \, dx = \left[\frac{x^2}{2} + x \right]_{-1}^1$ $= \left[\left(\frac{1}{2} + 1 \right) - \left(\frac{1}{2} - 1 \right) \right]$ $= 2$	2 1 1	4
15.		$\vec{b}_1 = \vec{i} - 2\vec{j} \quad \vec{b}_2 = 3\vec{i} + 2\vec{j}$ $\vec{b}_1 \cdot \vec{b}_2 = 3 + 0 - 0 = 3$ $ \vec{b}_1 = \sqrt{1+4} = \sqrt{5} \quad \vec{b}_2 = \sqrt{9+4} = \sqrt{13}$ $\cos \theta = \left \frac{\vec{b}_1 \cdot \vec{b}_2}{ \vec{b}_1 \vec{b}_2 } \right = \frac{3}{\sqrt{5}\sqrt{13}} = \frac{3}{\sqrt{65}}$	1 1 1	4
16.		$P(A \cap B') = P(A) - P(A \cap B)$ $= 0.3 - P(A) \cdot P(B)$ $= 0.3 - 0.3 \times 0.6$ $= 0.3 - 0.18 = 0.12$	1+1 1 1	4

No	Qns	Answer Key/Value Points	Score	Score
17.	(a)	(ii) $A' = A$	1	6
	(b)	(iii) $(A')' = A$	1	
	(c)	$A + B = \begin{bmatrix} 1 & 4 \\ 5 & 8 \end{bmatrix}$ $(A+B)' = \begin{bmatrix} 1 & 5 \\ 4 & 8 \end{bmatrix}$ - (1) $A' + B' = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix} + \begin{bmatrix} 0 & 3 \\ 4 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 5 \\ 4 & 8 \end{bmatrix}$ - (2) From (1) and (2) $(A+B)' = A' + B'$	2	
18.		System can be written as $AX = B$ where $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ $X = \begin{bmatrix} x \\ y \end{bmatrix}$ $B = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$ $ A = -1 \neq 0$, system is consistent $\text{adj } A = \begin{bmatrix} 3 & -2 \\ -2 & 1 \end{bmatrix}$ $A^{-1} = \frac{\text{adj } A}{ A } = \begin{bmatrix} -3 & 2 \\ 2 & -1 \end{bmatrix}$ $X = A^{-1}B = \begin{bmatrix} -3 & 2 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} 2 \\ 3 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ $x = 0, y = 1$	1 1 1 1 1	6
19.	(a)	projection of \vec{a} on $\vec{b} = \frac{\vec{a} \cdot \vec{b}}{ \vec{b} }$ $= \frac{2+6+8}{\sqrt{9}} = \frac{16}{3}$	1 2	6
	(b)	$\text{area} = \vec{a} \times \vec{b} $ $\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 4 \\ 1 & 2 & 2 \end{vmatrix} = \hat{i}(6-8) - \hat{j}(4-4) + \hat{k}(4-3)$ $= -2\hat{i} + \hat{k}$ $\text{area} = \sqrt{4+1} = \sqrt{5}$	1 1 1	

No

Qns

Answer Key/Value Points

Score

Total
Score

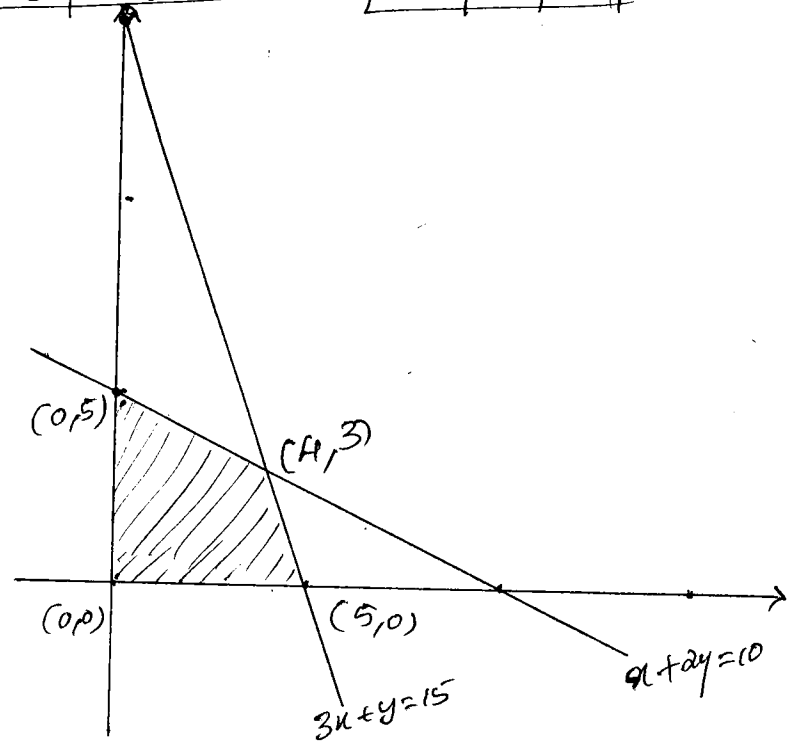
20

$$x + 2y = 10$$

$$3x + y = 15$$

x	0	10
y	5	0

x	0	5
y	15	0



Corner points	$Z = 3x + 4y$
(0, 0)	0
(0, 5)	20
(5, 0)	15
(4, 3)	24 ← Max

Maximum $Z = 24$ at $(4, 3)$

1

4

1

(6)