ANSWER KEY

SECOND YEAR HIGHER SECONDARY EXAMINATION MARCH 2022

PART-I/II/III

SUBJECT: MATHEMATICS (COMMERCE)

CODE NO: ~~SY 55~~ / SAY 751 VERSION: T

60 SCORES 2 HOURS

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1.		(iii) $(2,2) \in R$	1	1
2.		$\frac{\pi}{2}$	1	1
3.		$1-0=1$	1	1
4.		$\frac{dy}{dx} = 2x \ (at\ x=2) = 4$	1	1
5.		$\int_a^b y\,dx$ or $\int_a^b f(x)\,dx$	1	1
6.		3	1	1
7.		(ii) $\bar{a} \times \bar{b} = 0$	1	1
8.		$\bar{s} = (5i+2j-4k) + \lambda(3i+2j-8k)$	1	1
9.		(i) $P(E \cap F) \neq P(E)\,P(F)$	1	1
10.		(i) $\pi/4$	1	1
11.		(iii) 0	1	1
12.		(ii) e^x	1	1
13.		(i) 1	1	1

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14.		$a_{11}=1,\ a_{12}=0,\ a_{21}=3,\ a_{22}=2$ $A=\begin{bmatrix}1 & 0\\ 3 & 2\end{bmatrix}$	$\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$	2
15.		$A=\pi r^2$ $\frac{dA}{dr}=2\pi r=6\pi\ cm^2/cm$		2
16.		slope of tangent, $\frac{dy}{dx}=4x+3\cos x$ $=3$ at $x=0$. Slope of normal $=\frac{-1}{\frac{dy}{dx}}=\frac{-1}{3}$		2
17.		$\int\frac{dy}{1+y^2}=\int\frac{dx}{1+x^2}$ $\tan^{-1}y=\tan^{-1}x+c$		2
18.		$y=x^2+3x+2$ $\frac{dy}{dx}=2x+3$ $\frac{d^2y}{dx^2}=2$		2
19.		$y=e^{-3x}$ $\frac{dy}{dx}=-3e^{-3x}\quad \frac{d^2y}{dx^2}=9e^{-3x}$ $\frac{d^2y}{dx^2}+\frac{dy}{dx}-6y=9e^{-3x}-3e^{-3x}-6e^{-3x}=0$		2
20.		$\frac{x_2-x_1}{PQ},\frac{y_2-y_1}{PQ},\frac{z_2-z_1}{PQ}$ $PQ=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}=\sqrt{9+4+64}=\sqrt{77}$ D.C. are $\frac{3}{\sqrt{77}},\frac{-2}{\sqrt{77}},\frac{8}{\sqrt{77}}$		2

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21.		$(gof)(2) = g(f(2)) = g(3) = 7$ $(gof)(3) = g(f(3)) = g(4) = 7$ $(gof)(4) = g(f(4)) = g(5) = 11$ $(gof)(5) = g(f(5)) = g(5) = 11$ $gof = \{(2,7), (3,7), (4,11), (5,11)\}$		3
22.	(i)	$A+B = \begin{bmatrix} 3 & 7 \\ 1 & 7 \end{bmatrix}$	1	
	(ii)	$AB = \begin{bmatrix} -6 & 26 \\ -1 & 19 \end{bmatrix}$	2	3
23.		$\bar{a} \times \bar{b} = \begin{vmatrix} i & j & k \\ 1 & -1 & 3 \\ 2 & -7 & 1 \end{vmatrix} = 20i + 5j - 5k$ Area $= \lvert \bar{a} \times \bar{b} \rvert = \sqrt{20^2 + 5^2 + (-5)^2}$ $= 15\sqrt{2}$ sq. units		3
24	(i)	$k + 2k + 3k = 1$ $k = 1/6$	1	
	(ii)	$P(X<2) = P(X=0) + P(X=1)$ $= \frac{1}{6} + \frac{2}{6} = \frac{1}{2}$	2	3
25	(i)	$5 * 7 = 35$ $20 * 16 = 80$	2	
	(ii)	Yes	1	3

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26.		$\begin{bmatrix}2 & 1\\ 1 & 1\end{bmatrix} = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix} A$ $\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix} = \begin{bmatrix}1 & -1\\ 0 & 1\end{bmatrix} A$ $R_1 \to R_1 - R_2$ $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix} = \begin{bmatrix}1 & -1\\ -1 & 2\end{bmatrix} A$ $R_2 \to R_2 - R_1$ $A^{-1} = \begin{bmatrix}1 & -1\\ -1 & 2\end{bmatrix}$		3
27.		E – first ball black F – second ball black $P(E \cap F) = P(E)\, P(F/E)$ $= \frac{10}{15} \times \frac{9}{14} = \frac{3}{7}$		3
28.	(i)	$\tan^{-1} x + \tan^{-1} y = \tan^{-1} \frac{x+y}{1-xy}$	1	
	(ii)	$L.S. = \tan^{-1} \frac{\frac{1}{2} + \frac{2}{11}}{1 - \frac{1}{2} \cdot \frac{2}{11}} = \tan^{-1} \frac{15}{20}$ $= \tan^{-1} \frac{3}{4}$	3	4
29.	~~a)~~	~~(iv) $\lim_{x \to c} f(x) = f(c)$~~	~~3~~	
	b)	$LHL = \lim_{x \to 2} 2x + 3 = 7$ $RHL = \lim_{x \to 2} 2x - 3 = 1$ $LHL \neq RHL$ If is not continuous at $x = 2$	4	4

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30.		$f(x) = x^2 - 4x + 6$ $f'(x) = 0 \Rightarrow 2x - 4 = 0$ $\Leftrightarrow x = 2$  $f'(0) = 2\times 0 - 4 < 0$ f is increasing in $(2,\infty)$ and decreasing in $(-\infty, 2)$		4
31.		$\bar{a}_2 - \bar{a}_1 = i - k$ $\bar{b}_1 \times \bar{b}_2 = \begin{vmatrix} i & j & k \\ 2 & -1 & 1 \\ 3 & -5 & 2 \end{vmatrix} = 3i - j - 7k$ $\lvert\bar{b}_1 \times \bar{b}_2\rvert = \sqrt{59}$ $d = \left\lvert \frac{(\bar{b}_1 \times \bar{b}_2) \cdot (\bar{a}_2 - \bar{a}_1)}{\lvert\bar{b}_1 \times \bar{b}_2\rvert} \right\rvert = \frac{10}{\sqrt{59}}$		4
32.		$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = \begin{vmatrix} 1 & a & a^2 \\ 0 & b-a & b^2-a^2 \\ 0 & c-a & c^2-a^2 \end{vmatrix}$ $= (b-a)(c-a) \begin{vmatrix} 1 & a & a^2 \\ 0 & 1 & b+a \\ 0 & 1 & c+a \end{vmatrix}$ $= (a-b)(b-c)(c-a)$		4
33.		$n = 10 \quad p = \frac{1}{2}$ $P(X = x) = {}^nC_x\, p^x q^{n-x} = {}^{10}C_x \left(\frac{1}{2}\right)^{10}$ $P(X = 6) = {}^{10}C_6 \left(\frac{1}{2}\right)^{10} = \frac{105}{512}$		4

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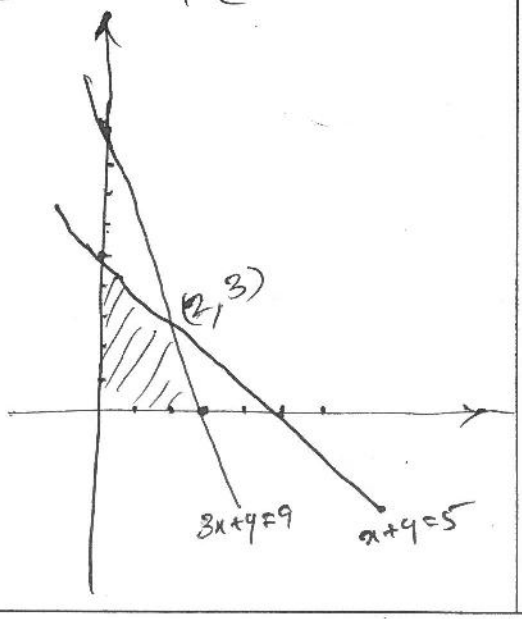
34.	(i)	$\|A\| = \begin{vmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{vmatrix}$ $= 10 \neq 0$ non singular	1	
	(ii)	$adjA = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & 5 \\ 1 & -2 & 3 \end{bmatrix}$	3	
	(iii)	$X = A^{-1}.B = \frac{1}{10}\begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & 5 \\ 1 & -2 & 3 \end{bmatrix}\begin{bmatrix} 4 \\ 0 \\ 2 \end{bmatrix}$ $= \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix}$ $\therefore x = 2, y = -1, z = 1$	2	6
35.	(i)	$\int \sin mx\, dx = \frac{1}{m}.-\cos mx + c$	2	
	(ii)	$\int \frac{1}{x^2-16}\, dx = \frac{1}{8}\log\left\|\frac{x-4}{x+4}\right\| + c$	2	
	(iii)	$\int x e^x dx = xe^x - \int e^x dx$ $= xe^x - e^x + c$	2	6
36.		$x+y=5$ <table><tr><td>x</td><td>0</td><td>5</td></tr><tr><td>y</td><td>5</td><td>0</td></tr></table> $3x+y=9$ <table><tr><td>x</td><td>0</td><td>3</td></tr><tr><td>y</td><td>9</td><td>0</td></tr></table> 		

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		corner points $Z = 4x + y$ $(0,0)$ 0 $(3,0)$ 12 ← max $(2,3)$ 11 $(0,5)$ 5 max. $Z = 12$ at $(3,0)$	6	