ANSWER KEY

FIRST YEAR HIGHER SECONDARY EXAMINATION ....MARCH... 2024

PART-I/II/III

SUBJECT: .....MATHEMATICS...Science (60)

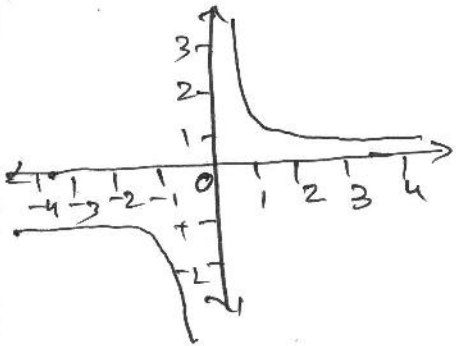CODE NO: ..F.Y.-427   VERSION:.......

.60.. SCORES $\left(\frac{1}{13}\right)$ ....2... HOURS

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1	(i)	c) 2^6	①	
	(ii)	$\dfrac{x}{3}+1 = -\dfrac{2}{3}$	½	
		$x = -5$	½	3
		$y - \dfrac{2}{3} = \dfrac{2}{3}$	½	
		$y = \dfrac{4}{3}$	½	
2	(i)	$\cos(x+y) + \cos(x-y) = 2\cos x \cos y$	①	
	(ii)	$\cos\left(\dfrac{3\pi}{4}+x\right) + \cos\left(\dfrac{3\pi}{4}-x\right)$		
		$= 2\cos\dfrac{3\pi}{4}\cos x$	①	3
		$= 2 \times \dfrac{-1}{\sqrt{2}} \times \cos x$	½	
		$= -\sqrt{2}\cos x$	½	
3	(i)	$x + \dfrac{x}{2} + \dfrac{x}{3} \le 10 + \dfrac{x}{6}$		
		$6x + 3x + 2x \le 60 + x$	①	
		$11x \le 60 + x$	½	3
		$10x \le 60$		
		$x \le 6$	½	
	(ii)	← ——————|—————— → 6	①	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		Remark Using the solution of (i). The graph of (ii) is correct give 1 score		
4	(i)	c) $nC_r = \dfrac{n!}{r!\,(n-r)!}$	①	
	(ii)	Out of 7 men 3 can be selected in $7C_3$ ways	$\frac{1}{2}$	
		Out of 5 women, 2 can be selected in $5C_2$ ways	$\frac{1}{2}$	3
		∴ Total number of ways = $7C_3 \times 5C_2$ ① OR Direct answer give '2' score.		
5	(i)	2^n	①	
	(ii)	$\left(\dfrac{x}{3}+\dfrac{3}{x}\right)^4 = 4C_0\left(\dfrac{x}{3}\right)^4 + 4C_1\left(\dfrac{x}{3}\right)^3\left(\dfrac{3}{x}\right)^1$ $+\ 4C_2\left(\dfrac{x}{3}\right)^2\left(\dfrac{3}{x}\right)^2 + 4C_3\left(\dfrac{x}{3}\right)^1\left(\dfrac{3}{x}\right)^3$ $+\ 4C_4\left(\dfrac{3}{x}\right)^4$	$1\frac{1}{2}$	3
		$= \dfrac{x^4}{81} + 4\cdot\dfrac{x^2}{9} + 6 + 4\times\dfrac{9}{x^2} + \dfrac{81}{x^4}$	$\frac{1}{2}$	
		$= \dfrac{x^4}{81} + \dfrac{4x^2}{9} + 6 + \dfrac{36}{x^2} + \dfrac{81}{x^4}$		
		Remarks Correct expansion of $(a+b)^n$ — give 1 score		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
6	(i)	Slope $= -A/B = \frac{3}{4}$	$\frac{1}{2}$	
		$y - y_1 = m(x - x_1)$	1	
		$y + 3 = \frac{3}{4}(x - 2)$	$\frac{1}{2}$	
		$3x - 4y - 18 = 0$		
		OR		3
		Alternative method with correct answer give '2' score.		
	(ii)	$D = \left| \dfrac{Ax_1 + By_1 + C}{\sqrt{A^2 + B^2}} \right|$	$\frac{1}{2}$	
		$= \left| \dfrac{0 - 0 + 12}{\sqrt{3^2 + 4^2}} \right|$		
		$= \dfrac{12}{5}$	$\frac{1}{2}$	
7		$x^2 = 12y$		
		$4a = 12$		
		$a = 3$	$\frac{1}{2}$	
		Focus $= (0, a)$	$\frac{1}{2}$	
		$= (0, 3)$		3
		Equation of directrix $y = -a$	$\frac{1}{2}$	
		$y = -3$	$\frac{1}{2}$	
		Length of Latus rectum $= 4a$	$\frac{1}{2}$	
		$= 12$	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
8	(i)	$n\,a^{n-1}$	①	
	(ii)	$n \cdot 2^{n-1} = 32$	①	3
		$\qquad = 2^5$	½	
		$\qquad = 4 \cdot 2^3$		
		$\qquad n = 4$	½	
9	(i)	$A \cap A' = \phi$	①	
	(ii)	$A' = \{1, 5, 6\}$	½	
		$B' = \{1, 5\}$	½	
		$A \cap B = \{2, 3, 4\}$	1	4
		$(A \cap B)' = \{1, 5, 6\}.$	½	
		$A' \cup B' = \{1, 5, 6\}$	½	
10	(i)		②	
		OR Rough sketch		
	(ii)	$9 - x^2 \geq 0$	½	
		$x^2 \leq 9$		
		$-3 \leq x \leq 3$	½	
		$Domain = [-3, 3]$		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$x = \sqrt{9-y^2}$	$\frac{1}{2}$	
		$0 \le y \le 3$	$\frac{1}{2}$	4
		Range $= [0,3]$		
		OR for direct correct Domain and Range give 2 score.		
II	i)	$(1-i)^2 = 1 - 2i + i^2$	$\frac{1}{2}$	
		$= 1 - 2i - 1$		
		$= -2i$	$\frac{1}{2}$	
		$(1-i)^6 = (-2i)^3$	$\frac{1}{2}$	
		$= -8i^3$		
		$= 8i$	$\frac{1}{2}$	
		Using Binomial theorem give 2 score. for correct answer.		4
	(ii)	$z = \dfrac{1-i}{1+i}$		
		$= \dfrac{(1-i)(1-i)}{(1+i)(1-i)}$	1	
		$= \dfrac{1 - 2i + i^2}{2}$		
		$= -i$	$\frac{1}{2}$	
		$= 0 - i$		
		Coordinate in the argand plane $= (0, -1)$	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
12	(i)	$nPr = r! \; nCr$	$\frac{1}{2}$	
		$840 = r! \times 35$		
		$r! = \dfrac{840}{35}$		
		$r! = 24$	1	
		$r = 4$	$\frac{1}{2}$	
	(ii)	$\left. \begin{array}{l} A - 1 \\ T - 4 \\ I - 1 \\ U - 1 \\ D - 1 \\ E - 1 \\ \hline \quad 9 \end{array} \right\}$	1	4
		Number of permutations $= \dfrac{9!}{4!}$	1	
		Remarks		
		(i) $nPr = \dfrac{n!}{(n-r)!} \longrightarrow \left(\frac{1}{2}\right)$		
		$nCr = \dfrac{n!}{r! \, (n-r)!} \longrightarrow \left(\frac{1}{2}\right).$		
		(ii) Using the word ATTITUDE Answer is correct give 2 score.		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
13	(i)	$y - y_1 = m(x - x_1)$, $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ $y - 0 = 1(x - 1)$ $y = x - 1$	① $\frac{1}{2}$ $\frac{1}{2}$	4
	(ii)	Slope of $\perp^r$ line to PQ $\big\} = -1$ $y - y_1 = m(x - x_1)$ $y - 4 = -1(x + 1)$ $y - 4 = -x - 1$ $x + y = 3$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
		Alternative method give full score.		
14		$a = 5$ $c = 4$ $b^2 = a^2 - c^2$ $= 25 - 16$ $= 9$ $b = 3$	$\frac{1}{2}$	4
	(i)	Length of the minor axis $= 2b$ $= 6$	$\frac{1}{2}$	
	(ii)	Length of the Latus rectum $= \dfrac{2b^2}{a}$ $= \dfrac{2 \times 9}{5}$ $= \dfrac{18}{5}$	$\frac{1}{2}$ $\frac{1}{2}$	
		Eccentricity $= \dfrac{c}{a}$ $= \dfrac{4}{5}$	$\frac{1}{2}$ $\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
6	(iii)	Equation of the ellipse. $$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$	$\frac{1}{2}$	
		$$\frac{x^2}{25} + \frac{y^2}{9} = 1$$	$\frac{1}{2}$	
15	(i)	Any point with x-coordinate $-ve$, y and z are positive. eg: $(-2, 3, 4)$	①	
	(ii)	$AB = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2 + (z_2-z_1)^2}$	$\frac{1}{2}$	4
		$= \sqrt{1^2 + 1^2 + 4^2}$		
		$= \sqrt{18}$	$\frac{1}{2}$	
		$BC = \sqrt{9+9+0} = \sqrt{18}$	①	
		$AC = \sqrt{16+4+16} = \sqrt{36}$	①	
		$AB^2 + BC^2 = AC^2$ $\therefore \triangle ABC$ is right angled		
16	(i)	$N(S) = 13C_3$	$\frac{1}{2}$	
		$P(3 \text{ balls are white}) = \frac{5C_3}{13C_3}$	$\frac{1}{2}$	
	(ii)	$P(3 \text{ balls are red}) = \frac{8C_3}{13C_3}$	①	4
	(iii)	$P(1 \text{ ball is red and Two balls are white})$ $= \frac{8C_1 \times 5C_2}{13C_3}$	②	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
17	(i)	b) $\frac{\sqrt{3}}{2}$	①	
	(ii)	$\dfrac{\sin 3x - \sin x}{\cos^2 x - \sin^2 x} = \dfrac{2\cos\left(\frac{3x+x}{2}\right)\sin\left(\frac{3x-x}{2}\right)}{\cos 2x}$	①	
		$= \dfrac{2\cos 2x \sin x}{\cos 2x}$	$\frac{1}{2}$	
		$= 2\sin x$	$\frac{1}{2}$	
	(iii)	$\tan(\theta + \phi) = \dfrac{\tan\theta + \tan\phi}{1 - \tan\theta\tan\phi}$	①	6
		$= \dfrac{\frac{1}{2} + \frac{1}{3}}{1 - \frac{1}{2}\times\frac{1}{3}}$	①	
		$= \dfrac{5/6}{5/6}$		
		$= 1$	$\frac{1}{2}$	
		$\therefore \theta + \phi = \dfrac{\pi}{4}$	$\frac{1}{2}$	

Any alternative method to find $\theta + \phi = \pi/4$ give full score.

Remark
(ii) $\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$ give $\frac{1}{2}$

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
18	(i)	$a = 2$	$\frac{1}{2}$	
		$r = 4$	$\frac{1}{2}$	
		$ar^{n-1} = 32768$	$\frac{1}{2}$	
		$2 \times r^{n-1} = 32768$		
		$r^{n-1} = \dfrac{32768}{2}$		
		$= 16384$		
		$4^{n-1} = 4^{7}$		
		$n-1 = 7$		
		$n = 8$	$\frac{1}{2}$	6
	(ii)	$a + ar + ar^2 = 14$	①	
		$ar^3 + ar^4 + ar^5 = 112$	①	
		$\dfrac{a + ar + ar^2}{ar^3 + ar^4 + ar^5} = \dfrac{14}{112}$		
		$\dfrac{a(1 + r + r^2)}{ar^3(1 + r + r^2)} = \dfrac{1}{8}$		
		$\dfrac{1}{r^3} = \dfrac{1}{8}$		
		$r^3 = 8$		
		$r = 2$	½	
		$a(1 + 2 + 2^2) = 14$		
		$7a = 14$		
		$a = 2$	$\frac{1}{2}$	
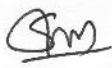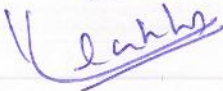
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$S_n = \dfrac{a(r^n - 1)}{r - 1}$	$\frac{1}{2}$	
		$= \dfrac{2(2^n - 1)}{2 - 1}$		
		$= 2(2^n - 1)$	$\frac{1}{2}$	
19	(i)	$f(x) = \frac{1}{x}$		
		$f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$	①	
		$= \lim\limits_{h \to 0} \dfrac{\frac{1}{x+h} - \frac{1}{x}}{h}$	①	6
		$= \lim\limits_{h \to 0} \dfrac{\left[\dfrac{x - (x+h)}{(x+h) \times x}\right]}{h}$		
		$= \lim\limits_{h \to 0} \dfrac{-h}{(x+h) \, x \times h}$		
		$= \lim\limits_{h \to 0} \dfrac{-1}{(x+h) \, x}$	$\frac{1}{2}$	
		$= \dfrac{-1}{x \times x}$		
		$= \dfrac{-1}{x^2}$	$\frac{1}{2}$	
		<u>Remark</u> $f'(x) = -\frac{1}{x^2}$ give 1 score.		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
	(ii)	$\dfrac{d}{dx}\left(\dfrac{x^2+1}{x^2-1}\right)$		
		$= \dfrac{(x^2-1)\dfrac{d}{dx}(x^2+1) - (x^2+1)\dfrac{d}{dx}(x^2-1)}{(x^2-1)^2}$	$1\frac{1}{2}$	
		$= \dfrac{(x^2-1)\times 2x - (x^2+1)\times 2x}{(x^2-1)^2}$	$1\frac{1}{2}$	
		$= \dfrac{-4x}{(x^2-1)^2}$		
		<u>Remark</u> Quotient Rule give 1 score.		
20.	(i)	$\bar{x} = \dfrac{\Sigma\, x_i}{n}$	$\frac{1}{2}$	
		$= \dfrac{80}{8}$		
		$= 10$	$\frac{1}{2}$	
		M·D about $\bar{x} = \dfrac{\Sigma\,|x_i-\bar{x}|}{n}$	$\frac{1}{2}$	
		$= \dfrac{24}{8}$ $= 3$	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
	(ii)	(see table below)		6

class	f_i	x_i	$f_i \times x_i$	x_i^2	$f_i \times x_i^2$
4 – 8	3	6	18	36	108
8 – 12	6	10	60	100	600
12 – 16	4	14	56	196	784
16 – 20	7	18	126	324	2268
	20		260		3760

Score: ② (for table)

$$\text{Variance} = \frac{\Sigma f_i x_i^2}{N} - \left(\frac{\Sigma f_i x_i}{N}\right)^2 \quad ①$$

$$= \frac{3760}{20} - \left(\frac{260}{20}\right)^2 \quad \left(\tfrac{1}{2}\right)$$

$$= 19 \quad \left(\tfrac{1}{2}\right)$$

Any alternative method give full score.

First Year Mathematics (Science)

1	Shaji mathew		9400743554
2	ABY SKARIAH		9562869701
3	BANAL KUMAR·Y·P		9446852271
4	SEENA·A·P·		9946967100
5	SABEER PUNNOTH		9447414339
6	SHINY·G·S		9495243274
7	Resh Paul		9495600560
8	Prakash·K·		9447381485
9	B·Jayadev		9400555339