CODE:0402- AG-FC-2-23-24 पजियन क्रमांक **REG.NO:-TMC -D/79/89/36**

General Instructions:

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E

EXAMINATION 2023 -24

Time : 3 Hours | Maximum Marks : 80

CLASS – XI | **MATHEMATICS**

Sr. No.	**SECTION – A** **This section comprises of very short answer type-questions (VSA) of 2 marks each**	Marks
Q.1	Which of the following is the empty set (a) $\{x : x$ is a real number and $x^2 - 1 = 0\}$ (b) $\{x : x$ is a real number and $x^2 + 1 = 0\}$ (c) $\{x : x$ is a real number and $x^2 - 9 = 0\}$ (d) $\{x : x$ is a real number and $x^2 = x + 2\}$	1
Q.2	If $\frac{\pi}{2} < \alpha < \pi,\ \pi < \beta < \frac{3\pi}{2};\ \sin\alpha = \frac{15}{17}$ and $\tan\beta = \frac{12}{5}$, then the value of $\sin(\beta - \alpha)$ is	1

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	(a) – 171/221 (b) – 21/221 (c) 21/221 (d) 171/221	
Q.3	The ends of latus rectum of parabola $x^2 + 8y = 0$ are (a)(–4, –2) and (4, 2)(b)(4, –2) and (–4, 2) (c) (–4, –2) and (4, –2)(d) (4, 2) and (–4, 2)	1
Q.4	$\lim_{x \to a} \frac{(x+2)^{5/3} - (a+2)^{5/3}}{x - a} =$ (a) $\frac{5}{3}(a+2)^{2/3}$ (b) $\frac{5}{3}(a+2)^{5/3}$ (c) $\frac{5}{3}a^{2/3}$ (d) $\frac{5}{3}a^{5/3}$	1
Q.5	How many words can be formed from the letters of the word COURTESY, whose first letter is C and the last letter is Y (a) $6!$ (b) $8!$ (c) $2(6)!$ (d) $2(7)!$	1
Q.6	The standard deviation of 25 numbers is 40. If each of the numbers is increased by 5, then the new standard deviation will be (a) 40 (b) 45 (c) $40 + \frac{21}{25}$ (d) None of these	1
Q.7	The sum of n terms of the series $\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16} + \ldots$ is (a) $2^n - n - 1$(b) $1 - 2^{-n}$(c) $n + 2^{-n} - 1$ (d) $2^n - 1$	1
Q.8	The equation of the parabola with focus (0, 0) and directrix $x + y = 4$ is (a) $x^2 + y^2 - 2xy + 8x + 8y - 16 = 0$ (b) $x^2 + y^2 - 2xy + 8x + 8y = 0$ (c) $x^2 + y^2 + 8x + 8y - 16 = 0$ (d) $x^2 - y^2 + 8x + 8y - 16 = 0$	1
Q.9	If the coordinates of A and B be (1, 1) and (5, 7), then the equation of the perpendicular bisector of the line segment AB is (a) $2x + 3y = 18$ (b) $2x - 3y + 18 = 0$ (c) $2x + 3y - 1 = 0$ (d) $3x - 2y + 1 = 0$	1
Q.10	$\cos 20^\circ \cos 40^\circ \cos 80^\circ =$ (a)1/2 (b) 1/4 (c) 1/6 (d) 1/8	1
Q.11	$\frac{1-2i}{2+i} + \frac{4-i}{3+2i} =$ (a) $\frac{24}{13} + \frac{10}{13}i$ (b) $\frac{24}{13} - \frac{10}{13}i$ (c) $\frac{10}{13} + \frac{24}{13}i$ (d) $\frac{10}{13} - \frac{24}{13}i$	1
Q.12	How many words can be made from the letters of the word DELHI, if L comes in the middle in every word (a) 12 (b) 24 (c) 60 (d) 6	1
Q.13	$\cos A + \cos(240^\circ + A) + \cos(240^\circ - A) =$ (a) $\cos A$ (b) 0 (c) $\sqrt{3}\sin A$ (d) $\sqrt{3}\cos A$	1

Q.14	If a circle whose center is (1, –3) touches the line $3x - 4y - 5 = 0$, then the radius of the circle is (a) 2 (b) 4 (c) $\frac{5}{2}$ (d) $\frac{7}{2}$	1
Q.15	If A and G be the AM and GM respectively between two then the numbers are (a) $A \pm \sqrt{G^2 - A^2}$ (b) $A \pm \sqrt{A^2 - G^2}$ (c) $A \pm \sqrt{A^2 + G^2}$ (d) $G \pm \sqrt{A^2 - G^2}$	1
Q.16	If the middle points of the sides BC, CA and AB of the triangle ABC be (1, 3), (5, 7) and (– 5, 7), then the equation of the side AB is (a) $x - y - 2 = 0$ (b) $x - y + 12 = 0$ (c) $x + y - 12 = 0$ (d) None of these	1
Q.17	The expression $2\cos\frac{\pi}{13}.\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$ is equal to (a) – 1 (b) 0 (c) 1 (d) None of these	1
Q.18	Let A = {2, 3} and B = {4,5}. Find (A × B). How many subsets will (A × B) have ? (a) 16 (b) 8 (c) 4 (d) none of these	1
	ASSERTION-REASON BASED QUESTIONS In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices. (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	
Q.19	**Assertion (A) :** The domain of the relations : R = {(–1, 1), (1, 1), (–2, 4), (2, 4), (2, 4), (3, 9)}is = {-2, -1, 1, 2, 3} . **Reason (R):** The set of all first components or coordinates of the ordered pairs belonging to R is called the domain of R .	1
Q.20	**Assertion (A) :** If $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$ then $x \in [1, \infty)$. **Reason (R) :** Multiplying (or dividing) each side of an inequation by the same positive number does not change the inequality and Multiplying (or dividing) each side of an inequation by the same negative number reverses the inequality.	1
	SECTION – B **This section comprises of very short answer type-questions (VSA) of 2 marks each**	
Q.21	Find the derivatives of w.r.to x : $\sin^5(x^5)$.	2
Q.22	How many numbers greater than 1000000 can be formed by using the digits 1, 2, 0,	2

	2, 4, 2, 4? **OR** If a + ib = $\frac{c+i}{c-i}$, where c is real prove that $a^2+b^2=1$ and $\frac{b}{a}=\frac{2c}{c^2-1}$.	
Q.23	If $\lim_{x \to a} \frac{x^5-a^5}{x-a} = 405$, find all possible values of a .	2
Q.24	Find the equation of an ellipse whose vertices are $(0,\pm 10)$ and eccentricity e = 4/5. **OR** Find the equation of the circle whose radius is 5 and touches y - axis at origin .	2
Q.25	If $f(x)=x^2$. Find $\frac{f(1.1)-f(1)}{1.1-1}$.	2
	SECTION – C **(This section comprises of short answer type questions (SA) of 3 marks each)**	
Q.26	A solution of 8 % boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4 % but less than 6% boric acid . If there are 640 liters of the 8% solution, how many liters of 2% solution will have to be added?	3
Q.27	Find the equation of the hyperbola satisfying the Foci $(\pm 5,0), the$ transverse axis is of length 8. OR Find the equation of the ellipse whose foci are at (0, ±4) and e = $\frac{4}{5}$.	3
Q.28	Find the equation of the circle which passes through the points (1, -2) and (4, -3) and has its center on the line 3x + 4y = 7.	3
Q.29	Given that the ordered pairs (a,7) and (-4,b) belongs to relation $\{(x,y): 2y-3x=8\}$. Find the value of a and b . OR Write the domain and range of $f(x)=\frac{x-2}{2-x}$.	3
Q.30	From a set of 100 cards numbered 1 to 100, one card is drawn at random. Find the probability that the number on the card is divisible by 6 or 8, but not by 24.	3
Q.31	The extremities of the base of an isosceles Δ are the points (2a, 0) and (0 , a) .the equation of the one of the sides is x = 2a . Find the equation. Of the other two sides and the area of the Δ. OR Find the direction in which a straight line must be drawn through the point (–1, 2) so that its point of intersection with the line $x + y = 4$ may be at a distance of 3 units from this point.	3
	SECTION – D	

	(This section comprises of long answer-type questions (LA) of 5 marks each)	
Q.32	If *a* and *b* are the roots of $x^2 - 3x + p = 0$ and *c, d* are roots of $x^2 - 12x + q = 0$, where *a, b, c, d* form a G.P. Prove that $(q + p) : (q - p) = 17:15$. OR If *f* is a function satisfying $f(x + y) = f(x)\, f(y)$ for all $x, y \in N$ such that $f(1) = 2$ and $\sum_{x=1}^{n} f(a + x) = 128\left(2^n - 1\right)$, find the value of a.	5
Q.33	Find the mean and standard deviation for the following data: Age : 25-30 30-35 35-40 40-45 45-50 50-55 F : 30 23 20 14 10 3	5
Q.34	A , B,C are three finite sets such that $n(A \cap B \cap C) = 3; n(U) = 50$ and n(A) =17 ;n(B) = 13, $n(C) = 15, n(A \cap B) = 9, n(B \cap C) = 4, n(C \cap A) = 5$ .Find (i) $n(A \cap B' \cap C')$ (ii) $n(B \cap A' \cap C')$ (iii) $n(C \cap A' \cap B')$ (iv) $n(A \cap B \cap C')$ (v) $n(B \cap C \cap A')$ (vi) $n(C \cap A \cap B')$ (vii) $n(A \cup B \cup C)$ (viii) $n(A \cup B \cup C)'$. Draw venn diagram also.	5
Q.35	There are three prizes to be distributed among 5 boys. In how many ways can it be done when **(i)** no boy gets more than one prize ? **(ii)** There is no restriction as to the number of prizes any boy gets? **(iii)** No boy gets all the prizes ? OR A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i)no girl ?(ii) at least one boy and one girl ?(iii) at least 3 girls ?	5
	SECTION – E (This section comprises of 3 case study / passage – based questions of 4 marks each with two sub parts (i),(ii),(iii) of marks 1, 1, 2 respectively.The third case study question has two sub – parts of 2 marks each.)	
Q.36	**Case Study based-1** For parabola $y^2 = 12x$	
i.	Find the coordinates of the focus	1
ii.	Find the coordinates of the vertex	1
iii.	Find equations of the directrix **OR** Find the length of the latus rectum	2
Q.37	**Case Study based-2**	

	A number of 4 different digits is formed by using the digits 1,2,3,4,5,6 in all possible ways	
i.	How many such number ----------	1
ii.	How many of these are exactly divisible by 2 -------	1
iii.	How many of these are divisible by 4 --------- **OR** How many of these end with 34 ----------	2
Q.38	**Case Study - 2** **Board Game-** In a board game, the number of sea cells in various cells forms an A.P. If the number of the sea cells in 3^{rd} and 11^{th} cells together is 68 and number of cells in 11^{th} cell is 24 more than that of 3^{rd} cell, then answer the following questions based on this data.	
i.	How many total sea cells are there in the first 13 cells? (a) 442 (b) 221 (c) 204 (d) Can't be determined	1
ii.	How many sea cells are there in the first cell? (a) 52 (b) 18 (c) 16 (d) 54	1
iii.	What is the sum of number of sea cells in the 7^{th} and 9^{th} cell? (a) 42 (b) 32 (c) 74 (d) 80 OR Altogether, How many sea cells are there in the first 5 cells? (a) 220 (b) 125 (c) 96 (d) 110	2
	"मेहनत करो, सफलता खुद आपके पास आएगी।"	