INDIAN SCHOOL SOHAR **No. of printed pages: 4**

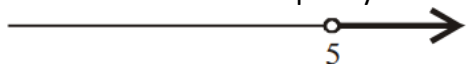
TERM II EXAMINATION (2023-24)
MATHEMATICS (CODE-041)

CLASS: XI **MAX. MARKS: 80**
DATE: 20/02/24 **TIME: 3 HOURS**

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 20 MCQ's and 2 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 mark each.
4. Section C has 6 Short Answer (SA)-type questions of 3 mark each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks.
6. Section E has 3 Source Based/Case Based/Passage Based/integrated units of assessment of 4 marks each with sub-parts.

SECTION – A
(Multiple Choice Questions) Each question carries 1 mark

1.	For any two sets A and B, $(A-B)\cup(B-A)$ is (a) $(A-B)\cup A$ (b) $(B-A)\cup B$ (c) $(A\cup B)-(A\cap B)$ (d) $(A\cup B)\cap(A\cap B)$
2.	Let U be the universal set containing 700 elements. If A and B are sub-sets of U such that n(A) = 200, n(B) = 300 and n$(A\cap B)=100$, then n$(A'\cap B')$ = _____ (a) 400 (b) 500 (c) 800 (d) 300
3.	The domain of the function f(x) = $\sqrt{x-1}+\sqrt{3-x}$ (a) [1, 3] (b) $(-\infty, 5]$ (c) (1, 3) (d) $(1, \infty)$
4.	Which one of the following is not a function? (a) $\{(x,y): x,y\in R, x^2=y\}$ (b) $\{(x,y): x,y\in R, y^2=x\}$ (c) $\{(x,y): x,y\in R, x=y^3\}$ (d) $\{(x,y): x,y\in R, y=x^3\}$
5.	$sin^6\theta+cos^6\theta+3\,sin^2\theta\,cos^2\theta$ is equal to (a) 0 (b) 4 (c) 1 (d) 2
6.	If tan θ = 3 and θ lies in the third quadrant, then the value of cos θ is (a) $\frac{1}{\sqrt{10}}$ (b) $\frac{-1}{\sqrt{10}}$ (c) $\frac{3}{\sqrt{10}}$ (d) $-\frac{3}{\sqrt{10}}$
7.	If $\left(\frac{1+i}{1-i}\right)^x$ = 1 and n $\in N$, then (a) x = 2n+1 (b) x = 4n+1 (c) x = 2n (d) x = 4n
8.	If |x – 1| > 5, then (a) $x\in(-4,6)$ (b) $x\in[-4,6]$ (c) $x\in(-\infty,-4)\cup(6,\infty)$ (d) $x\in(-\infty,-4)\cap(6,\infty)$
9.	Solution of a linear inequality in variable x is represented on number line is  5 (a) $[-\infty, 5)$ (b) (5,∞) (c) [5, ∞) (d) $[-\infty,5]$
10.	If $40C_{n+2}$ = $40C_{n-2}$, then value of n is (a) 20 (b) 18 (c) 14 (d) 28
11.	The number of ways to arrange the letters of the word ***HAPPY*** are (a) 120 (b) 90 (c) 60 (d) 150

12.	The ratio of sum of first three terms of a GP to the sum of the first six terms is 64:91. The common ratio is (a) ¼ (b) 4/3 (c) ¾ (d) 1
13.	If one A.M, *A* and two G.M p and q are inserted between two numbers a and b, then which of the following is true? (a) $a^3 + b^3 = 2Apq$ (b) $p^3 + q^3 = 2Apq$ (c) $a^3 + b^3 = 2Aab$ (d) None of these
14.	The total number of terms in the expansion of $(x - a)^{99} - 1$ is (a) 100 (b) 51 (c) 50 (d) 101
15	A line passes through the point (2,2) and is perpendicular to the line 3x + y = 3. It's y intercept is (a) 4/3 (b) 1/3 (c) 5 (d) 15
16.	x-axis is the intersection of the two planes (a) xy and xz (b) xy and yz (c) xz and yz (d) none of these
17.	Without repetition, four-digit numbers are formed with the numbers 0, 2, 3 and 5. What is the probability of it to be divisible by 5? (a) 1/5 (b) 4/5 (c) 1/30 (d) 5/9
18.	If a + ib = c + id, then (a) $a^2 + c^2 = 0$ (b) $b^2 + c^2 = 0$ (c) $b^2 + d^2 = 0$ (d) $a^2 + b^2 = c^2 + d^2$
	ASSERTION – REASON BASED QUESTIONS In the following question, 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 correct explanation of A (b) Both A and R are true and R is not correct explanation of A (c) A is true but R is false (d) A is false but R is true
19.	Assertion (A) : Mean deviation about the median of 38, 70, 48, 34, 63, 42, 55, 44, 54 and 46 is 8.6 Reason (R) : MD(Median) = $\frac{\Sigma\lvert x_i - \text{Median}\rvert}{n}$
20.	Assertion (A) : $\frac{d}{dx}\left(\frac{1}{x}\right) = \frac{1}{x^2}$ Reason (R) : $\frac{d}{dx}(x^n) = nx^{n-1}$
	SECTION – B [This section comprises of very short answer type questions (VSA) of 2 marks each]
21.	Prove that $\frac{1+sin\,2\theta+cos\,2\theta}{1+sin\,2\theta-cos\,2\theta} = cot\,\theta$ **[OR]** If A lies in second quadrant and 3 tan A + 4 = 0, then find the value of 2 cot A – 5 cos A + sin A
22.	Find the equation of the ellipse with length of major axis 26 and foci (±5, 0) **[OR]** Find eccentricity and the length of the latus rectum of $\frac{y^2}{9} - \frac{x^2}{27} = 1$
23.	Verify that (0, 7, 10), (-1, 6, 6) and (-4, 9, 6) are the vertices of a right-angled triangle.
24.	Prove that the derivative of $\sin^2 x$ is sin2x
25.	Find the variance and standard deviation for the following data: 6, 10, 7, 13, 4, 12, 8, 12
	SECTION – C [This section comprises of very short answer type questions (SA) of 3 marks each]
26.	Find the domain of the function given by f(x) = $\frac{1}{\sqrt{[x]^2-[x]-6}}$

27. Prove that $sin^3 x + sin^3\left(\frac{2\pi}{3} + x\right) + sin\left(\frac{4\pi}{3} + x\right) = -\frac{3}{4} sin\, 3x$

[OR]

Show that $\left(1 + cos\frac{\pi}{8}\right)\left(1 + cos\frac{3\pi}{8}\right)\left(1 + cos\frac{5\pi}{8}\right)\left(1 + cos\frac{7\pi}{8}\right) = \frac{1}{8}$

28. Find the values of x and y for which the complex numbers $-3 + ix^2y$ and $x^2 + y + 4i$ are conjugates of each other.

[OR]

Find z, if $|z + 1| = z + 2(1 + i)$

29. A rod of length 12 cm moves with it ends always touching the coordinate axes. Determine the equation of the locus of a point P on the rod which is 3 cm from the end in contact with the x-axis.

30. Solve the following system of inequalities: $\frac{2x+1}{7x-1} > 5$, $\frac{x+7}{x-8} > 2$

31. If p and q are the lengths of the perpendiculars from the origin to the lines $x\, cos\,\theta - y\, sin\,\theta = k\, cos\, 2\theta$ and $x\, sec\,\theta + y\, cosec\,\theta = k$, respectively.
Prove that $p^2 + 4q^2 = k^2$

[OR]

Find the equations of the two sides of of an equilateral triangle whose one side is 2x + y -1= 0 and the vertex opposite to this side is (-3, 0)

SECTION – D

[This section comprises of long answer type questions (LA) of 5 marks]

32. Evaluate $\lim\limits_{x\to\frac{\pi}{4}} \frac{tan^3 x - tan\, x}{cos\left(x+\frac{\pi}{4}\right)}$

[OR]

If $f(x) = \begin{cases} mx^2 + n, & x < 0 \\ nx + m, & 0 \le x \le 1 \\ nx^3 + m, & x > 1 \end{cases}$

For what integers m and n does both $\lim\limits_{x\to 0} f(x)$ and $\lim\limits_{x\to 1} f(x)$ exist?

33. (i) Draw the graph of cos x in the interval [-4π, 4π]
(ii) Find the value of cos (-1710°)

34. If a, b, c, d are GP, prove that $(a^n + b^n)$, $(b^n + c^n)$ and $(c^n + d^n)$ are in GP

35. Find the mean and variance for the following data.

Height (cm)	70 - 75	75 - 80	80 - 85	85 - 90	90 - 95	95 - 100	100-105	105-110	110-115
No. of children	3	4	7	7	15	9	6	6	3

SECTION – E

[This section comprises of 3 case -study/passage-based questions of 4 marks each with sub-parts. The first two case study questions have three sub-parts (i), (ii) and (iii) of marks 1,1,2 respectively. The third case study question has two sub parts of 2 marks each.]

36. Shreya, Pakhi, Amit and Roy won medals for Science Olympiad while Sara, Abi, Roy and Ajith won medals for Mathematics Olympiad. Let X be the set of students who won for Science and Y be the set of students who won for Mathematics. Based on this information answer the following questions.
(i) Find X ∪ Y
(ii) Find X - Y
(iii) Draw Venn diagram to represent the above data and shade X ∩ Y'

[OR]

(iii) If X ∩ A = Y ∩ A = ∅ and X ∪ A = Y ∪ A, for some set A, show that X = Y

37.	A state cricket authority has to choose a team of 11 members. The authority asks 2 coaches of a government academy to select the team members that have experienced as well as the best performers in last 15 matches. They can make up a team of 11 cricketers amongst 15 possible candidates.  Based on the above information, answer the following questions. (i) In how many ways can the final eleven be selected from 15 cricket players if there is no restriction? (ii) In how many ways can the final eleven be selected from 15 cricket players if one of them must be included? (iii) In how many ways can the final eleven be selected from 15 cricket players if one of them, who is bad form must be excluded? **[OR]** (iii) If there are 6 bowlers, 3 wicket keepers and 11 batsmen in all. Find the number of ways of selecting 4 bowlers, 2 wicket keepers and 5 batsmen to form the team.
38.	A young man visits a hospital for medical checkup. The probability that he has lungs problem is 0.55, heart problem is 0.29 and either lungs or heart problem is 0.57. What is the probability that he has (i) both lungs as well as heart problem (ii) Lungs problem but not heart problem