Name... Aheen Mittal..

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No. of Printed Page : 7

TERM-1 EXAMINATION (2025-2026)
MATHEMATICS
CLASS-XI

Time: 3hrs. **MM - 80**

General Instructions:

1. **This Question paper contains five sections - A, B, C, D and E. Each section is compulsory. However, internal choices are provided.**
2. **Section A has 18 MCQs and 02 Assertion-Reason (A-R) based questions of 1 mark each. Section B has 05 questions of 2 marks each. Section C has 06 questions of 3 marks each. Section D has 04 questions of 5 marks each.Section E has 03 Case-study / Source-based / Passage-based questions with sub-parts (4 marks each).**

SECTION-A (1 X 20=20)
(Multiple Choice Questions)

Q.1 Representation of $\sec\theta$ in terms of $\sin\theta$ where $\frac{\pi}{2} < \theta < \pi$ is:

(a) $\frac{1}{\sqrt{1-\sin^2\theta}}$ (b) $-\frac{1}{\sqrt{1-\sin^2\theta}}$

(c) $\frac{1}{\sqrt{1-\cos^2\theta}}$ (d) $-\frac{1}{\sqrt{1-\cos^2\theta}}$

Q.2 If f: R→ R, given by f(x)=x^2+3, the pre-image of 2 under f is

(a)7 (b)5 (c)-1 (d)Doesn't exist

Q.3 The number of different messages that can be represented by three 0's and two 1's is

(a)120 (b)20 (c)10 (d) 60

Q.4 If in a group of n distinct objects, the number of arrangements of 4 objects is 12 times the number of arrangements of 2 objects, then the number of objects are:

(a)8 (b)6 (c)10 (d)4

Q.5 If f (x) = $x^3 - \frac{1}{x^3}$ then $f(x) + f\left(\frac{1}{x}\right)$ =?

(a)$2x^3$ (b) $2\frac{1}{x^3}$ (c)0 (d) 1

Q.6 What is the solution set for $\frac{|x-2|}{x-2} > 0$

(a) $(2,\infty)$ (b)$(1,\infty)$ (c)$(-\infty,-2)$ (d)$(0,2)$

Q.7 If ${}^{n}_{12}C = {}^{n}_{8}C$, then n is equal to

(a) 20 (b) 12 (c) 6 (d) 30

Q.8 If $\left(\frac{1+i}{1-i}\right)^{x} = 1$, then:

(a) $x = 2n, n \in Z$ (b) $x = 2n + 1, n \in N$

(c) $x = 4n, n \in Z$ (d) $x = 4n + 1, n \in N$

Q9. Meenakshi thought of two different finite sets having m and n elements. The number of subsets of the first set is 112 more than that of the second set. The values of m and n are, respectively:

(a) 4,7 (b) 7,4 (c) 4,4 (d)7,7

Q.10 Priya has a wall clock in her living hall. The large hand of the clock is 49 cm long. How much distance does its extremity move in 30 minutes?

(a) 154cm (b)80cm (c)75cm (d) 77cm

Q.11 Let F1 be the set of parallelograms, F2 the set of rectangles, F3 the set of rhombuses, F4 the set of squares and F5 the set of trapeziums in a plane. Then F1 may be equal to

(a) $F2 \cap F3$ (b) $F3 \cap F4$ (c) $F2 \cup F5$ (d) $F2 \cup F3 \cup F4 \cup F1$

Q.12 The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of three parallel lines is

(a)6 (b) 18 (c) 12 (d) 9

Q.13 If $A \subset B$, then

(a) $A^c \subset B^c$ (b) $B^c \not\subset A^c$ (c) $A^c = B^c$ (d) $B^c \subset A^c$

Q.14 The length of a rectangle is three times the breadth. If the minimum perimeter of the rectangle is 160 cm, then

(a) breadth > 20 cm (b) length < 20 cm

(c) breadth $x \geq 20$ cm (d) length ≤ 20 cm

Q.15 The value of tan 1° tan 2° tan 3° ... tan 89° is

(a) 0 (b) 1 (c) $\frac{1}{2}$ (d) Not defined

Q16) In how many ways 8 distinct toys can be distributed among 5 ch

Q.16 If in a group of n distinct objects, the number of arrangements of 4 objects is 12 times the number o arrangements of 2 objects, then the number of objects is

(a) ${}^{8}P_5$ (b) ${}^{5}P_8$ (c) 5^8 (d) 8^5

Q.17 Which of the following is correct?

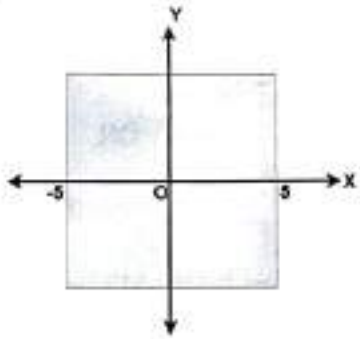
(a) $\sin 1° > \sin 1$

(b) $\sin 1° < \sin 1$

(c) $\sin 1° = \sin 1$

(d) $\sin 1° = \frac{\pi}{18} \sin 1$

Q.18 The inequality representing the following graph is:



(a) $|x| < 5$ (b) $|x| \leq 5$ (c) $|x| > 5$ (d) $|x| \geq 5$

In question number 19 and 20 a statement of Assertion (A) is followed by a statement of Reason (R). Choos the correct option out of the following choices.

(a) Both assertion (A) and reason (R) are true, and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true, and reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true, but reason (R) is false.

(d) Assertion (A) is false, but reason (R) is true.

Q.19 **Assertion (A):** $tan(A + B) = \frac{tanA+tanB}{1-tanAtanB}$ holds for all real A and B.
Reason (R): The formula fails when $A+B = \frac{\pi}{2} + n\pi$, where n is an integer

Q.20 **Assertion (A):** The solution set of $2x-3<5$ and $x+4 \geq 7$ is $x \geq 3$.
Reason (R): The solution of a system of linear inequalities in one variable is the intersection of t individual solution sets.

SECTION-B (2x5=10)

[This section comprises of very short answer type questions (VSA) of 2 marks each]

Q.21 Let T=$\left\{x: \frac{x+5}{x-7} - 5 = \frac{4x-10}{13-x}\right\}$. Is T an empty set? Justify your answer.

Q.22 If θ lies in the second quadrant, then show that:

$$\frac{\sqrt{1-sin\theta}}{\sqrt{1+sin\theta}} + \frac{\sqrt{1+sin\theta}}{\sqrt{1-sin\theta}} = -2sec\theta$$

Q.23 If $p + iq = \frac{(a+i)^2}{(2a-i)}$, then prove that $p^2 + q^2 = \frac{(a^2+1)^2}{4a^2+1}$

Q.24 Solve the system of inequations: $-5 \leq \frac{2-3x}{4} \leq 9$

OR

Solve the inequality: $\frac{2x-3}{x+1} \leq 2, x \neq -1$. Also, represent the solution set on the number line.

Q.25 How many ways can the letters of the word **"EXAM"** be arranged so that the vowel is always between the consonants? Justify your answer.

OR

The letters of the word **MANGO** are arranged in alphabetical order. Which is the **49th** word in the dictionary order?

SECTION-C (3X6=18)

[This section comprises of short answer type questions (SA) of 3 marks each]

Q.26 Find domain and range of f(x)= $\frac{5}{3-cos2x}$

OR

Find the domain of the following functions: f(x) = $\sqrt{4-x} + \frac{1}{\sqrt{x^2-1}}$

Q.27 Prove that $\frac{sec8\theta-1}{sec4\theta-1} = \frac{tan8\theta}{tan2\theta}$

OR

Prove that $cos6x = 32cos^6x - 48cos^4x + 18cos^2x - 1$

Q.28 If α and β are different complex numbers with $|\beta| = 1$, then find $\left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|$.

Q.29 Let A, B and C be the sets such that A∪B = A∪C and A∩B =A∩C. Using properties of sets, show that B=C.

Q.30 Find the rank of the word **"WOMAN"** when all its letters are arranged in alphabetical order.

Q.31 A solution of 9% acid is to be diluted by adding 3% acid solution to it. The resulting mixture is to be more than 5% but less than 7% acid. If there is 460 litres of the 9% solution, how many litres of 3% solution will have to be added?

SECTION-D (4x5=20)

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

Q.32 Prove that $\sin 10° \sin 30° \sin 50° \sin 70° = \frac{1}{16}$.

Hence find the value of $Cos20° cos40° cos60° cos80°$

OR

Prove that $Cos^2 A + Cos^2\left(A + \frac{\pi}{3}\right) + Cos^2\left(A - \frac{\pi}{3}\right) = \frac{3}{2}$

Q.33 Solve the following inequations graphically:

$$3x + 4y \leq 18$$
$$2x + 3y \geq 3$$
$$-7x + 4y \leq 14$$
$$x - 6y \leq 3$$
$$x \geq 0, y \geq 0$$

Q.34 How many words can be formed by taking 4 letters at a time out of the letters of the word **'MATHEMATICS'**

OR

In how many ways can the letters of the word **'INTERMEDIATE'** be arranged so that:

(i) the vowels occupy even places?

(ii) the relative orders of vowels and consonants do not change?

Q.35 (i) Define Modulus function. Write its domain and Range

(ii) Sketch the graph of modulus function.

(iii) Using the above definition, redefine the function : $\mathbf{f(x) = |x - 2| + |2 + x|, -3 \leq x \leq 3}$

OR

Consider function $f(x) = [x]$ and $g(x) = x^2$. Sketch the graph of $f(x)$ and find the domain of $(f+g)(x)$. Also find the value of (i) $(f+g)(\sqrt{2}$ (ii)$(f+g)(-2.5)$

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), (iii) of marks 1,1,2 respectively. The third case study question has two sub parts of 2 marks each.]

Q.36 A teacher teaches the topic of complex numbers and quadratic equations to the students of class XI. She says a complex number z is purely real if and only if $\bar{z} = z$ and is purely imaginary if and only if $\bar{z} = -z$.

Based on the information given, answer the following questions:

(i) If $(1+i)z = (1-i)\bar{z}$, find the value of $-i\bar{z}$.
(ii) Find the sum of four consecutive integral powers of i.
(iii) If x and y are real numbers and the complex number

$$\frac{(2+i)x-i}{4+i} + \frac{(1-i)y+2i}{4i}$$

is purely real, then what is the relation between x and y?

OR

If $z = \frac{3+2i\sin\theta}{1-2i\sin\theta}$ $\left(0 < \theta \leq \frac{\pi}{2}\right)$ is purely imaginary, find the value of θ.

Q.37 Arpit is riding on an arc bridge of diameter 9m over a lake. His position at any point (x,y) on the bridge is given by the function $y = f(x) = \sqrt{9 - x^2}$.

Based on the information given, answer the following questions:

(i) Is $x^2 + y^2 = 9$ a function? Justify
(ii) Find $f(1.5) + f(-1)$
(iii) Find the domain of the given function.

OR

Find the range of the given function.

Q.38 Ashish is writing examination. He is reading question paper during reading time. He reads the instructions carefully. While reading he observed that question paper consists of 15 questions divided into two parts. Part 1 containing 8 questions and part 2 containing 7 questions.

(i) If Ashish is required to attempt 8 questions in all selecting at least 3 from each part then I how many ways can he select these questions?

(ii) If Ashish is required to attempt 8 questions in all selecting 3 from part 1, then in how many ways can he select these questions.