Name: _____ **Enrolment No.** _____

AHMEDABAD UNIVERSITY
SCHOOL OF ARTS AND SCIENCES

UNDERGRADUATE PROGRAMME

2025–2026 MONSOON SEMESTER
MID SEMESTER EXAMINATION

MAT123 PRECALCULUS

SET B

Date: 29-11-2025 **Total Marks:** 50
Time: 11.00 am – 01.00 pm **No. of Printed Pages:** 4

General Instructions

1. Students must carry their identity card during the examination.
2. No break is allowed during the examination under any circumstances. In case of an emergency, with prior permission of the invigilator and an escort, a break of maximum five minutes is allowed.
3. No unauthorized devices, such as mobile phones, any kind of watches, other gadgets, or any kind of material is allowed on person.
4. Any violation of examination rules and an intent of malpractice will lead to strict disciplinary action, including a possible expulsion from the university.

Course-specific Instructions

1. Read the question paper (including all instructions) thoroughly before starting.
2. **Part 1:** It consists of objective-type questions with negative marking. Only one option is correct.
3. **Part 2:** It consists of MCQs with multiple correct choices.
   - To score the full point you **must select *all* correct options**.
   - **No partial credit** will be given for partially correct selections.
   - **YOU NEED TO SELECT ALL CORRECT ANSWERS.**
4. **Part 3:** It consists of subjective / explanation-based problems.
   - In Parts 1 and 2, there is no need to show rough work.
   - In Part 3, you **must** write mathematically correct statements and show all steps.

1 Objective type questions (6 questions of 2 marks each. For every correct answer, you get 2 marks and -0.5 marks for each incorrect answer)

1. For which of the following is $\frac{z}{1-i}$ purely real (where $z = a + bi$)?
   A. $a = b$
   B. $a = -b$
   C. $a = 0$
   D. $b = 0$

2. A water tank initially contains 600 liters of water. It is leaking at a constant rate of 12 liters per minute. What is the water left in the tank after 20 minutes?
   A. 240 liters.
   B. 120 liters.
   C. 360 liters.
   D. The tank is empty.

3. Consider the equation $x + \frac{5}{x} + 2 = 0$. Then
   A. The equation has two distinct real roots.
   B. The equation has two complex roots.
   C. The equation has double roots.
   D. None of the above.

4. Simplify the expression: $\frac{10x^2 + 11x - 6}{4x^2 - 9}$.
   A. $\frac{5x-2}{2x+3}$
   B. $\frac{5x+2}{2x-3}$
   C. $\frac{5x-2}{2x-3}$
   D. $\frac{5x+2}{2x+3}$

5. Consider the inequality: $\frac{2x-1}{x+3} > -5$. Then x belongs to
   A. $(-3, -2)$
   B. $(-\infty, -3) \cup (-2, \infty)$
   C. $(-\infty, 0)$
   D. None of the above.

6. Which of the following correctly simplifies $\frac{(j^2k)^4}{(j^2k)(j^2k)^{-3}}$?
   A. j^2k
   B. 1
   C. $j^{12}k^6$
   D. j^6k^6

2 Multiple options correct type questions. (6 questions of 3 marks each. Each question may have more than one correct option. Mark all the correct option to get the full 3 marks. No partial marks for not answering all the correct options.)

1. Let $z = a + bi$, $w = c + di$. Which of the following are always real numbers (for real a, b, c, d)?
   A. $z\overline{z}$
   B. $w\overline{w}$
   C. $z + \overline{z}$
   D. $z - \overline{z}$

2. Consider two points $A(4, 5)$ and $B(-4, -1)$. Which of the following are true?
   A. The distance between A and B is 10.
   B. The slope of the line joining A and B is $1/2$.
   C. The midpoint of the line segment joining A and B is $(0, 2)$.
   D. The line joining A and B passes through the origin.

3. Consider the equation $|x|x + 2|x| + 1 = 0$. Then the equation
   A. has double root at $x = -1$
   B. has two real roots $-1 + \sqrt{2}$ and $-1 - \sqrt{2}$.
   C. has only one real root.
   D. has no complex roots.

4. Consider the expression $\dfrac{4x^2 - 12x + 9}{2x^2 + 5x - 12}$. Which of the following statements are true?
   A. The simplified expression is $\dfrac{2x - 3}{x + 4}$.
   B. The expression is undefined at $x = -4$.
   C. The expression is undefined at $x = \dfrac{3}{2}$.
   D. The numerator is a perfect square trinomial.

5. If $|x^2 - 1| > 3$, then mark all the intervals which is a solution of the inequality.
   A. $(-\infty, -2)$
   B. $(-1, 1)$
   C. $(2, \infty)$
   D. $(1, \infty)$

6. Which of the following statements are correct?
   A. $0.\overline{714285}$ is a rational number.
   B. $\frac{8}{1-\sqrt{17}} = \frac{1+\sqrt{17}}{2}$.
   C. $8^{\frac{2}{3}} = 4$
   D. If two legs of a right-angle triangle are 3 cm and 4 cm, then the length of the hypotenuse must be 5 cm.

3 Subjective type questions. Show all steps to get full marks (every question carries 4 marks). *Do any five out of the seven following questions*

1. Let $z = 2 - 5i$. Compute and simplify
$$\frac{z^2}{\overline{z}}.$$
Express your answer in the form $a + bi$.

2. Find the equation of the perpendicular bisector of the line segment connecting the points $(2, 3)$ and $(-2, -5)$.

3. Find the real solution for the equation $x^2 + |x + 5| = 0$.

4. Suppose x is a real number and satisfies
$$|x - 2| + |x + 2| = 4.$$
Determine all possible values of x.

5. The area of a rectangular poster is $6x^2-11x-10$ square units. A flyer has an area of $2x^2-9x+10$ square units. How many flyers can fit on the poster?

6. Riya and Mehul are on the same basketball team. Last weekend, Mehul scored 2 more points than Riya, and together they scored fewer than 11 points. What are the possible numbers of points Mehul scored?

7. Simplify the following expression:
$$(12\sqrt{50a^2b^3c} - 7\sqrt{32a^2b^3c} + 9\sqrt{18a^2b^3c}).$$