PART 1 - MATHEMATICS

Topic : Complex numbers and quadratic equations

SECTION–1 : (Maximum Marks : 3)

- This section contains **ONE** question.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks	: +3	If ONLY the correct option is chosen;
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	: −1	In all other cases.

1. Let $\mathbb{R}$ denote the set of all real numbers. Let $a_i, b_i \in \mathbb{R}$ for $i \in \{1, 2, 3\}$.
Define the functions $f : \mathbb{R} \longrightarrow \mathbb{R}$, $g : \mathbb{R} \longrightarrow \mathbb{R}$, and $h : \mathbb{R} \longrightarrow \mathbb{R}$ by
$f(x) = a_1 + 10x + a_2x^2 + a_3x^3 + x^4$,
$g(x) = b_1 + 3x + b_2x^2 + b_3x^3 + x^4$,
$h(x) = f(x + 1) - g(x + 2)$.
If $f(x) \neq g(x)$ for every $x \in \mathbb{R}$, then the coefficient of x^3 in $h(x)$ is [JEE Advanced 2025 Paper 1]

(A) 8 (B) 2 (C) −4 (D) −6

Solution

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SECTION–2 : (Maximum Marks : 8)

- This section contains **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks	: +4	ONLY if (all) the correct option(s) is(are) chosen;
Partial Marks	: +3	If all the four options are correct but ONLY three options are chosen;
Partial Marks	: +2	If three or more options are correct but ONLY two options are chosen, both of which are correct;
Partial Marks	: +1	If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	: −2	In all other cases.

- For example, in a question, if **(A), (B) and (D)** are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get −2 marks.

2. Let a, b, c be positive integers in arithmetic progression such that the equation

$ax^2 + bx + c = 0$

has only integer solutions.

Then which of the following statements is (are) TRUE ? [JEE Advanced 2026 Paper 2]

(A) $c - b$ is an integer multiple of a

(B) Both the roots of the equation $ax^2 + bx + c = 0$ are odd integers

(C) If $c = 15$, then $ab = 8$

(D) If $b = 8$, then $x = 3$ is a root of the equation $ax^2 + bx + c = 0$

Solution

3. Let R denote the set of all real numbers. Let $z_1 = 1 + 2i$ and $z_2 = 3i$ be two complex numbers, where $i = \sqrt{-1}$. Let

$S = \{(x, y) \in R \times R : |x + iy - z_1| = 2|x + iy - z_2|\}$.

Then which of the following statements is (are) TRUE? [JEE Advanced 2025 Paper 1]

(A) S is a circle with centre $\left(-\frac{1}{3}, \frac{10}{3}\right)$

(B) S is a circle with centre $\left(\frac{1}{3}, \frac{8}{3}\right)$

(C) S is a circle with radius $\frac{\sqrt{2}}{3}$

(D) S is a circle with radius $\frac{2\sqrt{2}}{3}$

Solution

Space for Rough Work

SECTION–3 : (Maximum Marks : 8)

- This section contains **TWO** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, −0.33, −.30, 30.27, −127.30) in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If ONLY the correct answer is entered;
Zero Marks : 0 In all other cases.

4. For a non-zero complex number z, let arg(z) denote the principal argument of z, with $-\pi < \arg(z) \le \pi$. Let ω be the cube root of unity for which $0 < \arg(\omega) < \pi$. Let

$$\alpha = \arg\left(\sum_{n=1}^{2025} (-\omega)^n\right).$$

Then the value of $\frac{3\alpha}{\pi}$ is _____. [JEE Advanced 2025 Paper 2]

Scan or tap for the full solution

5. Let $f(x) = x^4 + ax^3 + bx^2 + c$ be a polynomial with real coefficients such that $f(1) = -9$. Suppose that $i\sqrt{3}$ is a root of the equation $4x^3 + 3ax^2 + 2bx = 0$, where $i = \sqrt{-1}$. If $\alpha_1, \alpha_2, \alpha_3$, and α_4 are all the roots of the equation $f(x) = 0$, then $|\alpha_1|^2 + |\alpha_2|^2 + |\alpha_3|^2 + |\alpha_4|^2$ is equal to _____. [JEE Advanced 2024 Paper 1]

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SECTION–4 : (Maximum Marks : 4)

- This section contains **ONE** question.
- Each question has **TWO** lists: **List-I** and **List-II**.
- Four options are given representing matching of elements from List-I and List-II. **ONLY ONE** of these four options corresponds to a correct matching.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If ONLY the correct option is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : −1 In all other cases.

6. Match each entry in **List-I** to the correct entry in **List-II** and choose the correct option.

[JEE Advanced 2026 Paper 1]

	List-I		List-II
P.	If α and β are the distinct roots of the equation $x^2 + x + 1 = 0$, then the quadratic equation with roots $\frac{1}{(\alpha+1)^{2026}}$ and $\frac{1}{(\beta+1)^{2026}}$ is	1.	$x^2 + x + 1 = 0$
Q.	If α and β are the distinct roots of the equation $x^2 + x + 1 = 0$, then the quadratic equation with roots $\frac{1}{(\alpha+1)^{2027}}$ and $\frac{1}{(\beta+1)^{2027}}$ is	2.	$x^2 - x + 1 = 0$
R.	If γ and δ are the distinct roots of the equation $x^2 - x + 1 = 0$, then the value of $\frac{1}{(\gamma-1)^{2026}} + \frac{1}{(\delta-1)^{2026}}$ is	3.	$x^2 + x - 1 = 0$
S.	If p and r are the distinct roots of the equation $x^2 + x - 1 = 0$, then the value of $\frac{1}{(p+1)^3} + \frac{1}{(r+1)^3}$ is	4.	−1
		5.	−4

(A) (P) → (1), (Q) → (2), (R) → (5), (S) → (4)
(B) (P) → (3), (Q) → (1), (R) → (4), (S) → (5)
(C) (P) → (1), (Q) → (2), (R) → (4), (S) → (5)
(D) (P) → (2), (Q) → (3), (R) → (5), (S) → (4)

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JEE ADVANCED COMPLEX NUMBERS AND QUADRATIC EQUATIONS — PYQS

Test Pattern : **JEE (Advanced)**

ANSWER KEY

SECTION–1

Ques.	1
Ans.	C

SECTION–2

Ques.	2	3
Ans.	A, B, C	A, D

SECTION–3

Ques.	4	5
Ans.	-2	20

SECTION–4

Ques.	6
Ans.	C

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