

PART 1 - MATHEMATICS

Topic : Sequences and series

SECTION-A : (Maximum Marks : 4)

This section contains **ONE** question.

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 : -1 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 -1 marks.

1. Let $S = \{a + b\sqrt{2} : a, b \in \mathbb{Z}\}$, $T_1 = \{(-1 + \sqrt{2})^n : n \in \mathbb{N}\}$, and $T_2 = \{(1 + \sqrt{2})^n : n \in \mathbb{N}\}$.

Then which of the following statements is (are) TRUE?

[JEE Advanced 2024 Paper 1]

(A) $Z \cup T_1 \cup T_2 \subset S$

(B) $T_1 \cap \left(0, \frac{1}{2024}\right) = \emptyset$, where $\emptyset$ denotes the empty set.

(C) $T_2 \cap (2024, \infty) \neq \emptyset$

(D) For any given $a, b \in \mathbb{Z}$, $\cos(\pi(a + b\sqrt{2})) + i\sin(\pi(a + b\sqrt{2})) \in \mathbb{Z}$ if and only if $b = 0$, where $i = \sqrt{-1}$.

Scan or tap for the full solution



Space for Rough Work

SECTION-B : (Maximum Marks : 4)

This section contains **ONE** question.

The answer to each question is a **NON-NEGATIVE INTEGER**.

For each question, enter the correct integer corresponding to the answer 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.

2. Let R denote the set of all real numbers. Let $f: R \rightarrow R$ be a function such that $f(x) > 0$ for all $x \in R$, and $f(x + y) = f(x)f(y)$ for all $x, y \in R$.

Let the real numbers $a_1, a_2, \dots, a_{50}$ be in an arithmetic progression. If $f(a_{31}) = 64f(a_{25})$, and

$$\sum_{i=1}^{50} f(a_i) = 3(2^{25} + 1),$$

then the value of

$$\sum_{i=6}^{30} f(a_i)$$

is _____.

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full solution



Space for Rough Work

JEE ADVANCED SEQUENCES AND SERIES — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-A																	
Ques.	1																
Ans.	A, C, D																
SECTION-B																	
Ques.	2																
Ans.	96																