Sequence and Series - Class XI

Past Year JEE Questions

Questions

Quetion: 01

The sum to infinite term of the series $1+\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+\frac{14}{3^4}+\ldots\ldots$ is

A. 3
B. 4
C. 6
D. 2

Solutions

Solution: 01

Explanation

We have

$$S=1+\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+\frac{14}{3^4}+\ldots\ldots\ldots\infty \quad \ldots(1)$$

Multiplying both sides by $\frac{1}{3}$ we get

$$\frac{1}{3}S=\frac{1}{3}+\frac{2}{3^2}+\frac{6}{3^3}+\frac{10}{3^4}+\ldots\ldots\ldots \quad \ldots(2)$$

Subtracting eqn. (2) from eqn. (1) we get

$$\frac{2}{3}S=1+\frac{1}{3}+\frac{4}{3^2}+\frac{4}{3^3}+\frac{4}{3^4}+\ldots\ldots\infty$$

$$\Rightarrow \frac{2}{3}S=\frac{4}{3}+\frac{4}{3^2}+\frac{4}{3^3}+\frac{4}{3^4}+\ldots\ldots\infty$$

$$\Rightarrow \frac{2}{3}S=\frac{\frac{4}{3}}{1-\frac{1}{3}}=\frac{4}{3}\times\frac{3}{2}$$

$$\Rightarrow S-3$$