NCERT 11.9.2.3

EE23BTECH11043 - BHUVANESH SUNIL NEHETE*

Question

In an A.P. the first term is 2 and the sum of the first five terms is one-fourth of the next five terms. Show that 20^{th} term is -112

Solution

$$T_1 + T_2 + T_3 + T_4 + T_5 = \frac{1}{4}[T_6 + T_7 + T_8 + T_9 + T_{10}]$$

Let the first term a and the common difference d:

$$[a+(a+d)+(a+2d)+(a+3d)+(a+4d)] = \frac{1}{4}[(a+5d)+(a+6d)+(a+7d)+(a+8d)+(a+9d)]$$

Simplifying:

$$(5a + 10d) = \frac{1}{4}(5a + 35d)$$

$$20a + 40d = 5a + 35d$$

$$15a + 5d = 0$$

$$3a+d = 0 \implies d = -3a \implies d = -6 \quad \text{(given } a = 2\text{)}$$

$$T_{20} = a + 19d = 2 + 19(-6) = -112$$