2 JEE Main 2021 (Online) 17th March Evening Shift

MCQ (Single Correct Answer)

If x, y, z are in arithmetic progression with common difference d, $x \neq 3d$, and the determinant of the matrix $\begin{bmatrix} 3 & 4\sqrt{2} & x \\ 4 & 5\sqrt{2} & y \\ 5 & k & z \end{bmatrix}$ is zero, then the value of k^2 is :

A 72

B 12

C 36

D 6

Explanation

$$\begin{vmatrix} 3 & 4\sqrt{2} & x \\ 4 & 5\sqrt{2} & y \\ 5 & k & z \end{vmatrix} = 0$$

$R_1 \to R_1 + R_3 - 2R_2$

$$\Rightarrow \begin{vmatrix} 0 & 4\sqrt{2} - k - 10\sqrt{2} & 0 \\ 4 & 5\sqrt{2} & y \\ 5 & k & z \end{vmatrix} = 0 \quad \{ \because 2y = x + z \}$$

$\Rightarrow (k - 6\sqrt{2})(4z - 5y) = 0$

$\Rightarrow$ k = $6\sqrt{2}$ or 4z = 5y (Not possible $\because$ x, y, z in A.P.)

So, k^2 = 72

$\therefore$ Option (A)