If $A = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{pmatrix}$ is a root of the polynomial $x^3 - 6x^2 + 7x + k = 0$, then the value of k is:

Solution: $A^3 - 6A^2 + 7A + kI = 0 \quad \cdots (i)$ $\qquad A = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{pmatrix}$

$\Rightarrow \lambda^3 - 6\lambda^2 + 7\lambda + 2 = 0 \rightarrow$ characteristic equation

$\therefore$ By Cayley – Hamilton Theorem ,

$A^3 - 6A^2 + 7A + 2I = 0 \quad \cdots (ii)$

By (i) & (ii), $k = 2$

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