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AI25BTECH11003 - Bhavesh Gaikwad

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Question

Consider the following simultaneous equations (with c_1 and c_2 being constants)

$$3x_1 + 2x_2 = c_1$$

$$4x_1 + x_2 = c_2$$

The characteristic equation for these simultaneous equations is

(CE 2017)

a) $\lambda^2 - 4\lambda - 5 = 0$

b) $\lambda^2 - 4\lambda + 5 = 0$

c) $\lambda^2 + 4\lambda - 5 = 0$

d) $\lambda^2 + 4\lambda + 5 = 0$

Theoretical Solution

Given:

$$3x_1 + 2x_2 = c_1 \tag{1}$$

$$4x_1 + x_2 = c_2 \tag{2}$$

Let $\mathbf{A} = \begin{pmatrix} 3 & 2 \\ 4 & 1 \end{pmatrix}$, $\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} c_1 \\ c_2 \end{pmatrix}$

From Equation 0.1 and 0.2,

$$\mathbf{Ax} = \mathbf{c} \tag{3}$$

The characteristic equation is given by,

$$|\mathbf{A} - \lambda \mathbf{I}| = 0 \tag{4}$$

$$\left| \begin{pmatrix} 3-\lambda & 2 \\ 4 & 1-\lambda \end{pmatrix} \right| = 0 \tag{5}$$

$$\tag{6}$$

Theoretical Solution

$$\boxed{\lambda^2 - 4\lambda - 5 = 0} \tag{7}$$

Thus, Option-A is correct.