SOLUTION: Problem 4S11

$$[S1] = \begin{bmatrix} \dfrac{A}{\mathrm{L}_e} & -\dfrac{A}{\mathrm{L}_e} \\ -\dfrac{A}{\mathrm{L}_e} & \dfrac{A}{\mathrm{L}_e} \end{bmatrix}$$

Its determinant is:

$$||S1|| = \frac{A^2}{\mathrm{L}_e^2} - \frac{A^2}{\mathrm{L}_e^2} = 0$$

hence, it is singular.

$$[S2] = \begin{bmatrix} -\dfrac{B}{2} & \dfrac{B}{2} \\ -\dfrac{B}{2} & \dfrac{B}{2} \end{bmatrix}$$

Its determinant is:

$$||S2|| = -\frac{B^2}{4} + \frac{B^2}{4} = 0$$

hence, it is singular.

$$[S3] = \begin{bmatrix} \dfrac{C\mathrm{L}_e}{3} & \dfrac{C\mathrm{L}_e}{6} \\ \dfrac{C\mathrm{L}_e}{6} & \dfrac{C\mathrm{L}_e}{3} \end{bmatrix}$$

Its determinant is:

$$||S2|| = \frac{C^2\mathrm{L}_e^2}{9} - \frac{C^2\mathrm{L}_e^2}{36} \neq 0$$

hence, it is not singular.

Because $[S3]$ is not singular, if it is present in the stiffness matrix, a unique solution will be obtained even when a y is not specified at any point in the domain.