Homework Assignment #1

Text Problems A.1, 7, 9, 10; B.3

Solve Problems A.1 through A.6 using matrices [A], [B], [C], [D], and {E} given by

$$[A] = \begin{bmatrix} 4 & 0 \\ 1 & 8 \end{bmatrix} \qquad [B] = \begin{bmatrix} 2 & 0 \\ 2 & 4 \end{bmatrix} \qquad [C] = \begin{bmatrix} 3 & 2 & 0 \\ -1 & 0 & 2 \end{bmatrix}$$

$$[D] = \begin{bmatrix} 5 & 2 & 1 \\ 2 & 10 & 0 \\ 1 & 0 & 5 \end{bmatrix} \qquad \{E\} = \begin{Bmatrix} 3 \\ 2 \\ 1 \end{Bmatrix}$$

(Write "nonsense" if the operation cannot be performed.)

A.1 **(a)** $[A] + [B]$ **(b)** $[A] + [C]$
(c) $[A][C]^T$ **(d)** $[D]\{E\}$
(e) $[D][C]$ **(f)** $[C][D]$

A.7 Show that $([A][B])^T = [B]^T[A]^T$ by using

$$[A] = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \qquad [B] = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \end{bmatrix}$$

A.9 Given the matrices

$$[X] = \begin{bmatrix} x & y \\ 1 & x \end{bmatrix} \qquad [A] = \begin{bmatrix} a & b \\ b & c \end{bmatrix}$$

show that the triple matrix product $[X]^T[A][X]$ is symmetric.

A.10 Evaluate the following integral in explicit form:

$$[k] = \int_0^L [B]^T E[B]\,dx$$

where $$[B] = \left[-\frac{1}{L} \quad \frac{1}{L}\right]$$

and E is the modulus of elasticity.
[*Note:* This is the step needed to obtain Eq. (10.1.16) from Eq. (10.1.15).]

B.3 Solve the following system of simultaneous equations by Gaussian elimination.

$$\begin{aligned} 2x_1 - 4x_2 - 5x_3 &= 6 \\ 2x_2 + 4x_3 &= -1 \\ 1x_1 - 1x_2 + 2x_3 &= 2 \end{aligned}$$