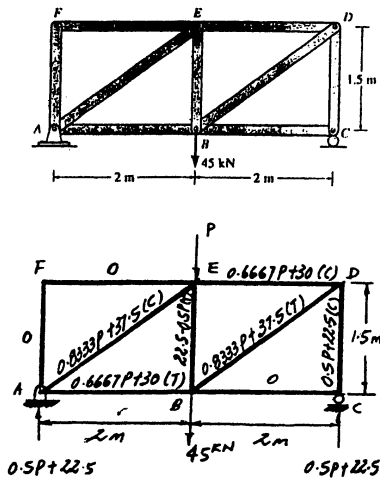


14-171. Solve Prob. 14–170 using Castigliano’s theorem.



| Member | N | $\partial N / \partial P$ | $N(P = 45)$ | L | $N(\partial N / \partial P) L$ |
|--------|---------------------|---------------------------|-------------|-----|--------------------------------|
| AF | 0 | 0 | 0 | 1.5 | 0 |
| AE | $-(0.8333P + 37.5)$ | -0.8333 | -37.5 | 2.5 | 78.125 |
| AB | $0.6667P + 30$ | 0.6667 | 30.0 | 2.0 | 40.00 |
| BE | $22.5 - 0.5P$ | -0.5 | 22.5 | 1.5 | -16.875 |
| BD | $0.8333P + 37.5$ | 0.8333 | 37.5 | 2.5 | 78.125 |
| BC | 0 | 0 | 0 | 2.0 | 0 |
| CD | $-(0.5P + 22.5)$ | -0.5 | -22.5 | 1.5 | 16.875 |
| DE | $-(0.6667P + 30)$ | -0.6667 | -30.0 | 2.0 | 40.00 |
| EF | 0 | 0 | 0 | 2.0 | 0 |

$$\Sigma = 236.25$$

$$\begin{aligned} \Delta_E &= \Sigma N \left(\frac{\partial N}{\partial P} \right) \frac{L}{AE} = \frac{236.25}{AE} \\ &= \frac{236.25(10^3)}{400(10^{-6})(200)(10^9)} = 2.95(10^{-3})\text{m} = 2.95 \text{ mm} \quad \text{Ans} \end{aligned}$$

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