



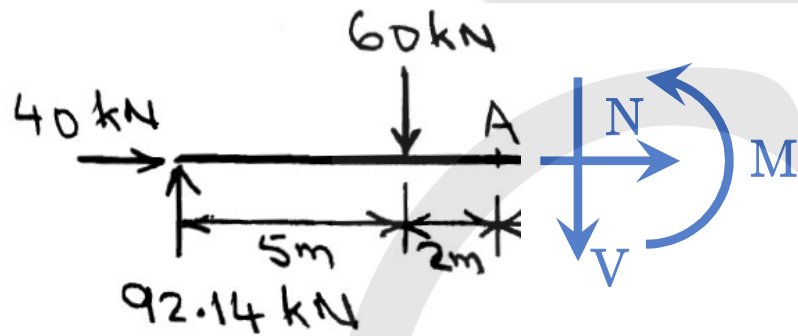
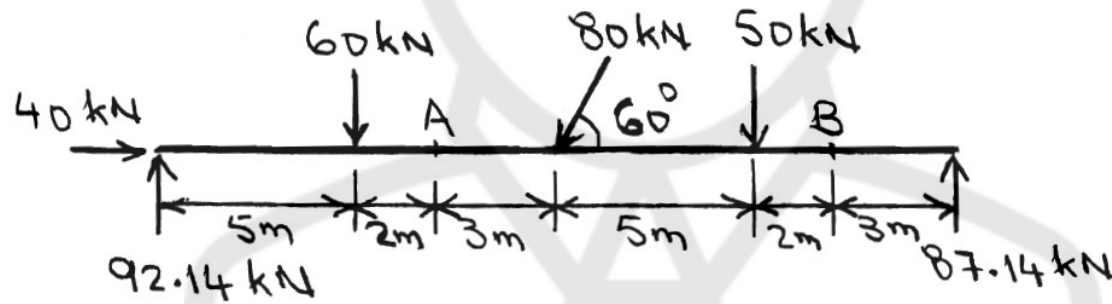
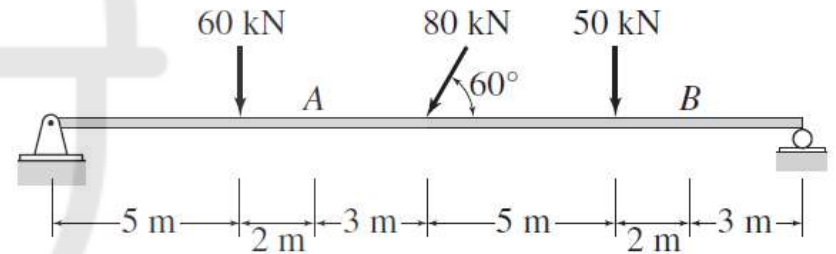
College of Technological Studies
Department of Civil Engineering Technology

CE 278 Structural Analysis

Tutorial (2)

Internal Forces in Beams

Example (1): Determine the internal forces in points A and B for the beam shown.

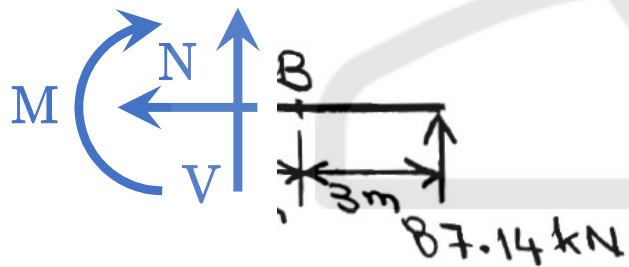
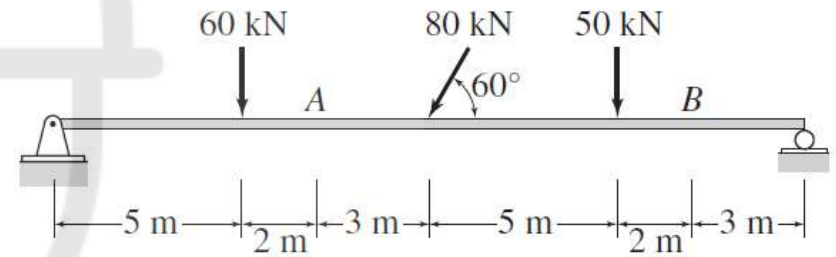
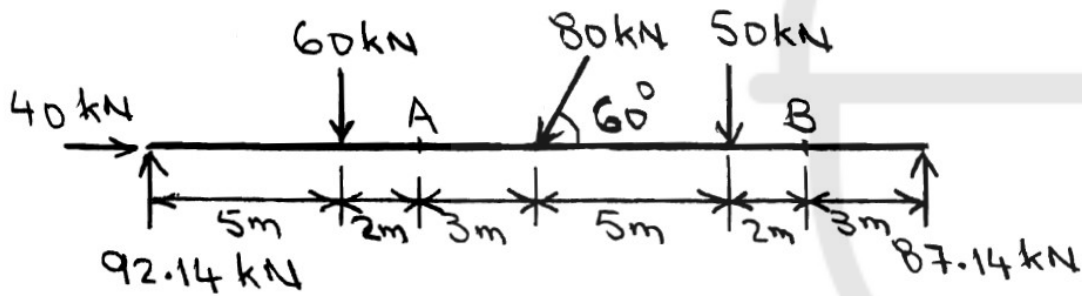


$$\sum F_x = 0 \quad 40 + N = 0 \quad N = -40 \text{ kN}$$

$$\sum F_y = 0 \quad 92.14 + (-60) - V = 0 \quad V = 32.14 \text{ kN}$$

$$\sum M_A = 0 \quad M - (92.14 \times 7) + (60 \times 2) = 0$$

$$M = 524.98 \text{ kN-m}$$



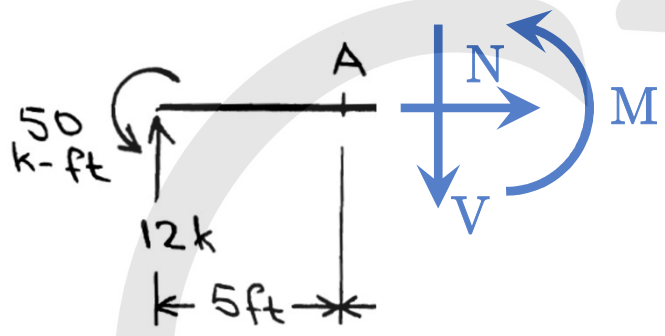
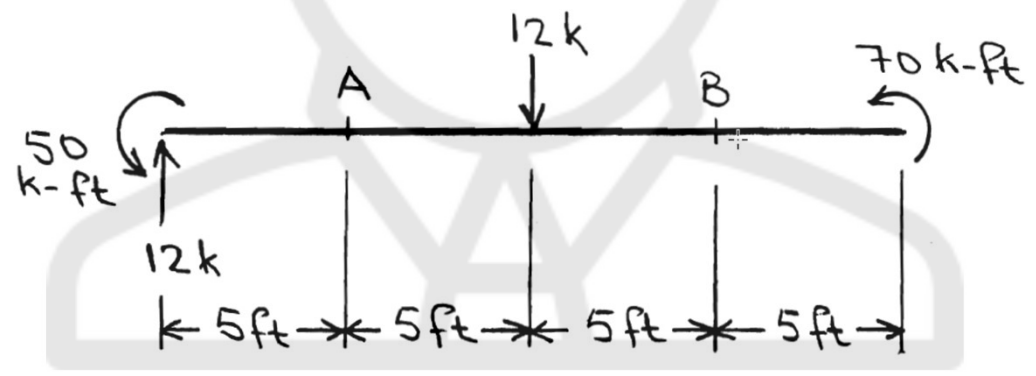
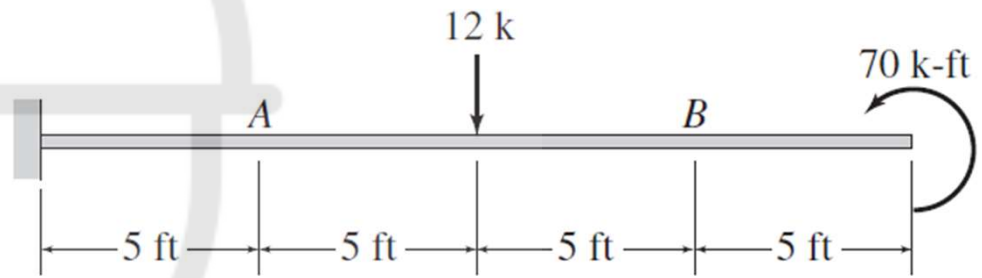
$$\sum F_x = 0 \quad N = 0 \text{ kN}$$

$$\sum F_y = 0 \quad V + 87.14 = 0 \quad V = -87.14 \text{ kN}$$

$$\sum M_B = 0 \quad -M + (87.14 \times 3) = 0$$

$$M = 261.42 \text{ kN}$$

Example (2): Determine the internal forces in points A and B for the beam shown.

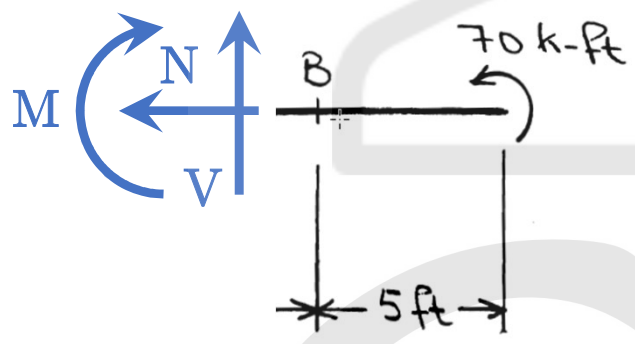
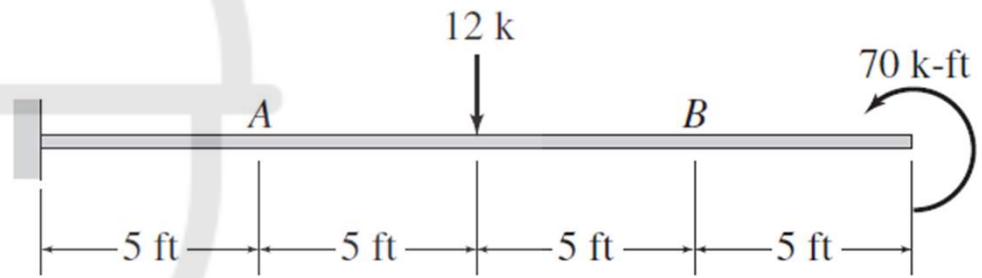
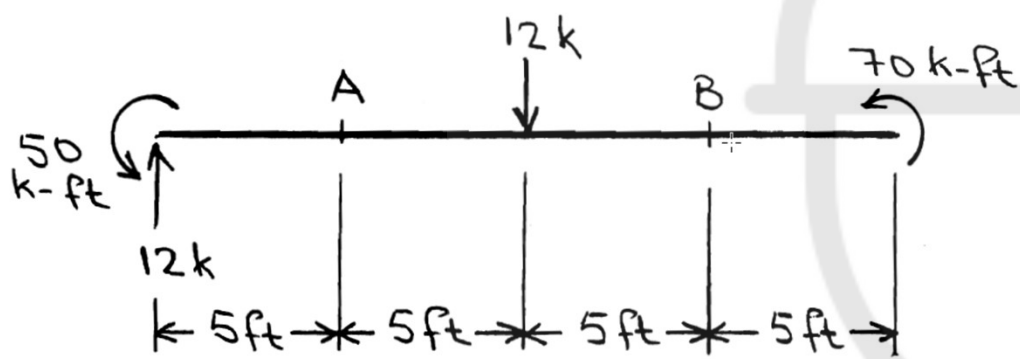


$$\sum F_x = 0 \quad N = 0 \text{ k}$$

$$\sum F_y = 0 \quad 12 - V = 0 \quad V = 12 \text{ k}$$

$$\sum M_A = 0 \quad M + 50 - (12 \times 5) = 0$$

$$M = 10 \text{ k-ft}$$

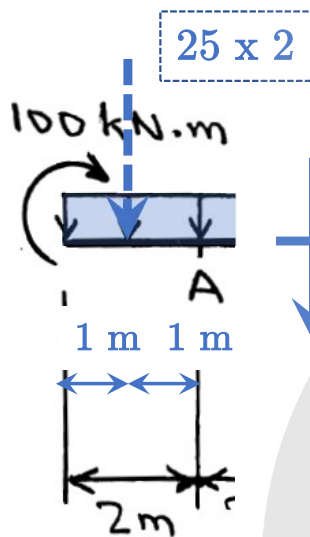
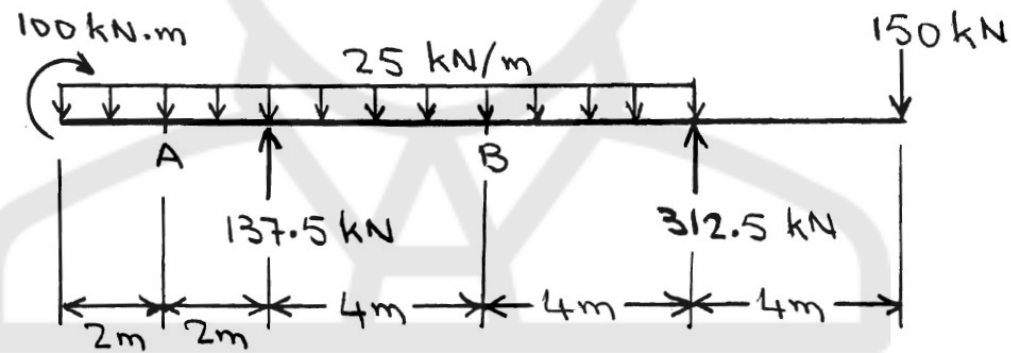
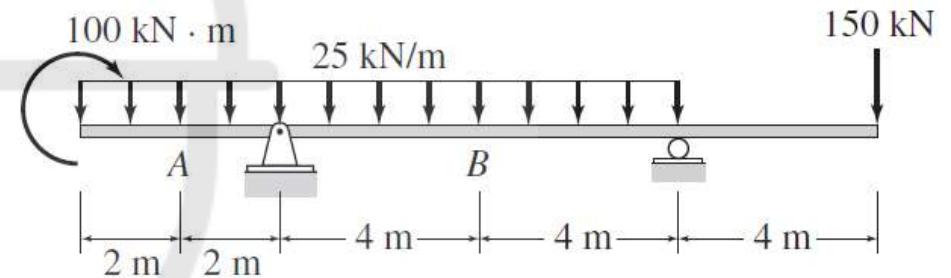


$$\sum F_x = 0 \quad N = 0 \text{ k}$$

$$\sum F_y = 0 \quad V = 0 \text{ k}$$

$$\sum M_B = 0 \quad -M + 70 = 0 \quad M = 70 \text{ k-ft}$$

Example (3): Determine the internal forces in points A and B for the beam shown.

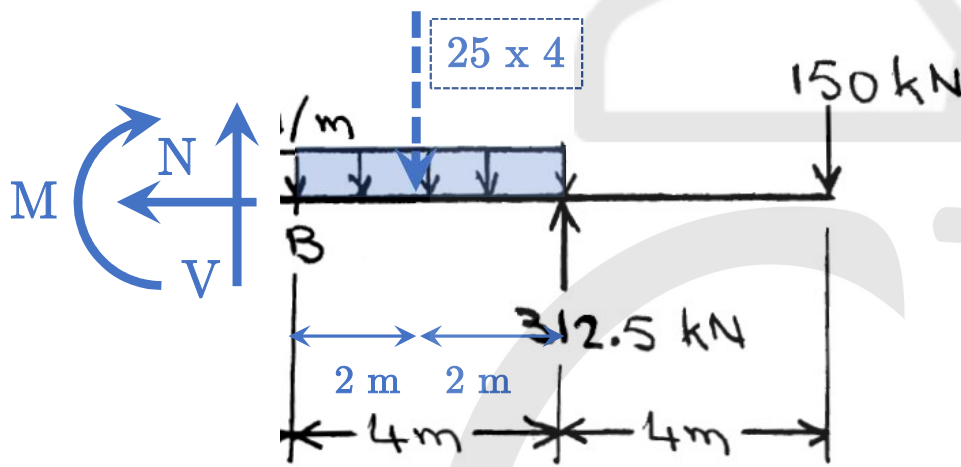
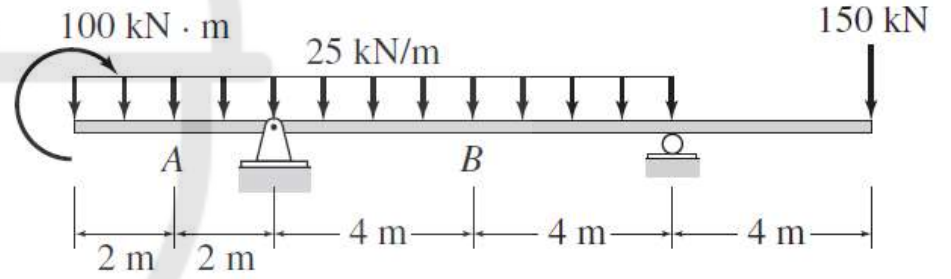
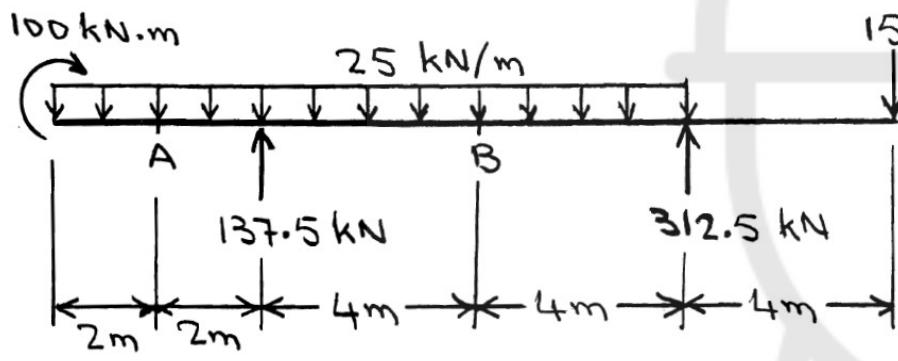


$$\sum F_x = 0 \quad N = 0 \text{ kN}$$

$$\sum F_y = 0 \quad -(25 \times 2) - V = 0 \quad V = -50 \text{ kN}$$

$$\sum M_A = 0 \quad M - 100 + (25 \times 2 \times 1) = 0$$

$$M = 50 \text{ kN}\cdot\text{m}$$



$$\sum F_x = 0 \quad N = 0 \text{ kN}$$

$$\sum F_y = 0 \quad V - (25 \times 4) + 312.5 - 150 = 0$$

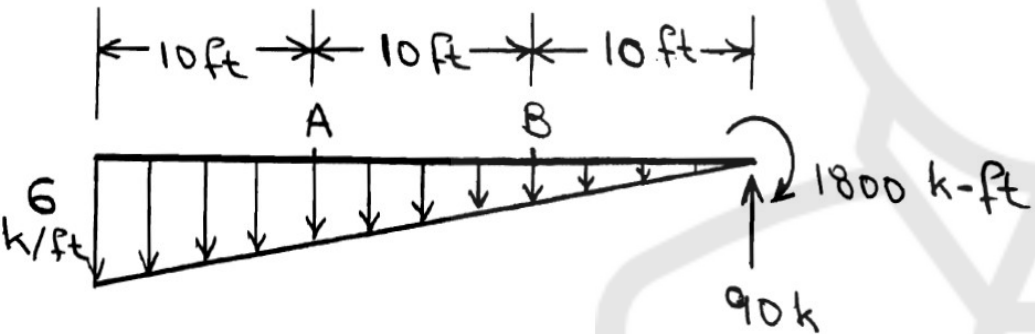
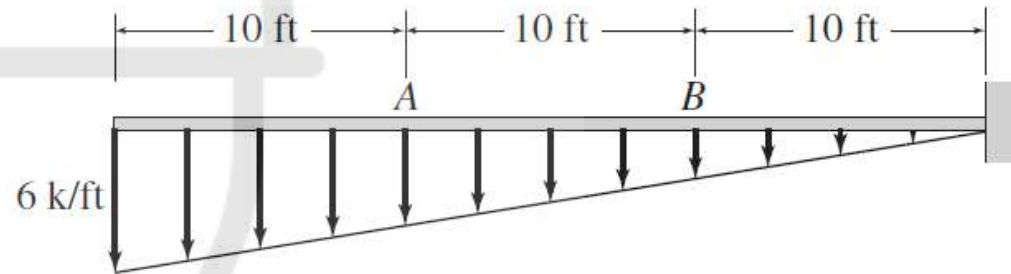
$$V = -62.5 \text{ kN}$$

$$\sum M_B = 0 \quad -M - (150 \times 8) + (312.5 \times 4)$$

$$- (25 \times 4 \times 2) = 0$$

$$M = -150 \text{ kN-m}$$

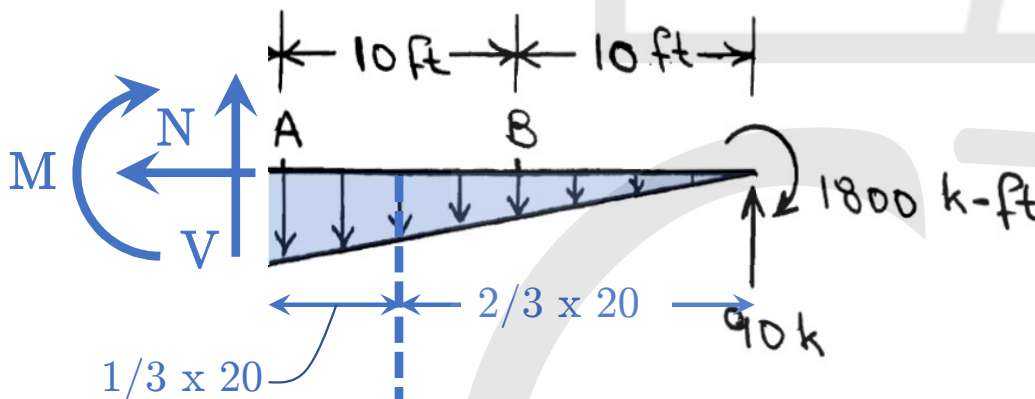
Example (4): Determine the internal forces in points A and B for the beam shown.



$$\sum F_x = 0 \quad N = 0 \text{ k}$$

$$\sum F_y = 0 \quad V - (0.5 \times 4 \times 20) + 90 = 0$$

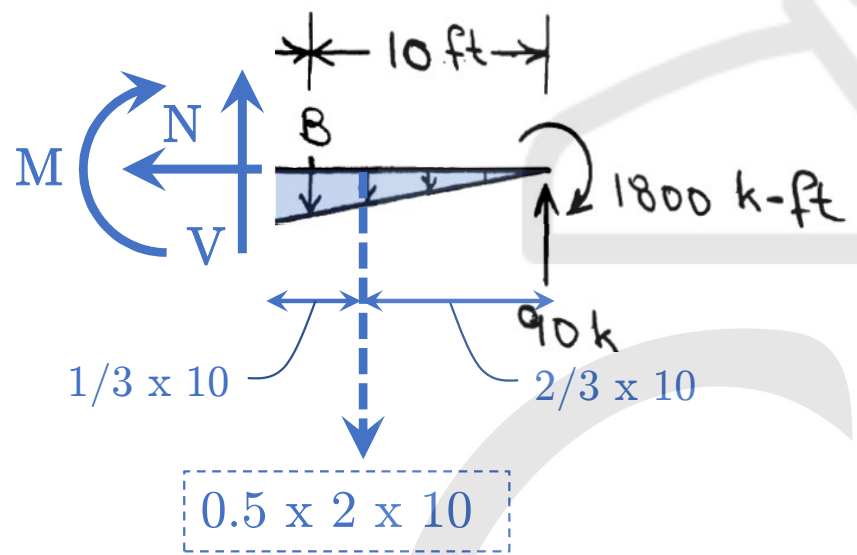
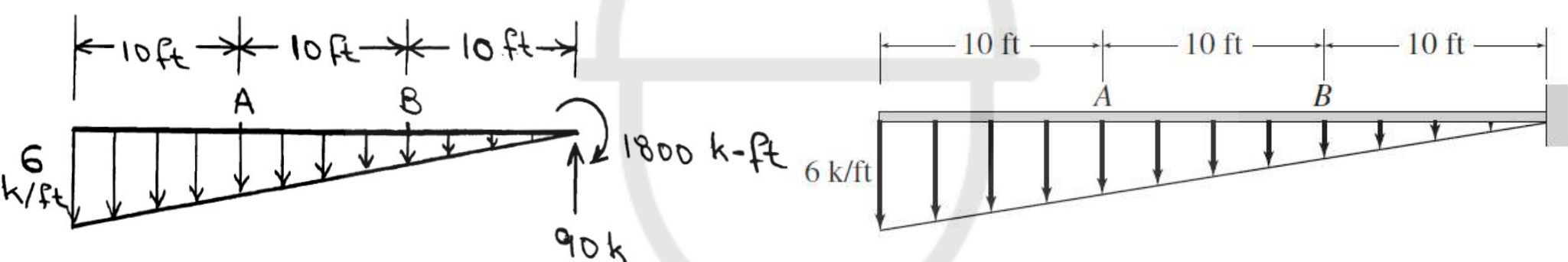
$$V = -50 \text{ k}$$



$$\sum M_A = 0 \quad -M - 1800 + (90 \times 20)$$

$$- \left(0.5 \times 4 \times 20 \times \left(\frac{1}{3} \times 20 \right) \right) = 0$$

$$M = -266.67 \text{ k-ft}$$



$$\sum F_x = 0 \quad N = 0 \text{ k}$$

$$\sum F_y = 0 \quad V - (0.5 \times 2 \times 10) + 90 = 0$$

$$V = -80 \text{ k}$$

$$\sum M_A = 0 \quad -M - 1800 + (90 \times 10)$$

$$- \left(0.5 \times 2 \times 10 \times \left(\frac{1}{3} \times 10 \right) \right) = 0$$

$$M = -933.33 \text{ k-ft}$$



Questions?