PROBLEM 5.66

For the beam and loading shown, determine (a) the magnitude and location of the resultant of the distributed load, (b) the reactions at the beam supports.

SOLUTION

\[ R_I = \frac{1}{2}(150 \text{ lb/ft})(9 \text{ ft}) = 675 \text{ lb} \]
\[ R_{II} = \frac{1}{2}(120 \text{ lb/ft})(9 \text{ ft}) = 540 \text{ lb} \]
\[ R = R_I + R_{II} = 675 + 540 = 1215 \text{ lb} \]
\[ \bar{X}R = \Sigma \bar{X}R: \quad \bar{X}(1215) = (3)(675) + (6)(540) \quad \bar{X} = 4.3333 \text{ ft} \]

(a) \[ R = 1215 \text{ lb} \]
\[ \bar{X} = 4.33 \text{ ft} \]

(b) Reactions:

\[ \Sigma M_A = 0: \quad B(9 \text{ ft}) - (1215 \text{ lb})(4.3333 \text{ ft}) = 0 \]
\[ B = 585.00 \text{ lb} \]

\[ \Sigma F_y = 0: \quad A + 585.00 \text{ lb} - 1215 \text{ lb} = 0 \]
\[ A = 630.00 \text{ lb} \]
PROBLEM 5.70

Determine the reactions at the beam supports for the given loading.

\[ R_1 = (200 \text{ lb/ft})(15 \text{ ft}) \]
\[ R_1 = 3000 \text{ lb} \]
\[ R_H = \frac{1}{2} (200 \text{ lb/ft})(6 \text{ ft}) \]
\[ R_H = 600 \text{ lb} \]

\[ + \Sigma M_A = 0: \quad -(3000 \text{ lb})(1.5 \text{ ft}) - (600 \text{ lb})(9 \text{ ft} + 2 \text{ ft}) + B(15 \text{ ft}) = 0 \]
\[ B = 740 \text{ lb} \]

\[ + \Sigma F_y = 0: \quad A + 740 \text{ lb} - 3000 \text{ lb} - 600 \text{ lb} = 0 \]
\[ A = 2860 \text{ lb} \]
PROBLEM 5.71

Determine the reactions at the beam supports for the given loading.

SOLUTION

First replace the given loading with the loading shown below. The two loadings are equivalent because both are defined by a linear relation between load and distance and the values at the end points are the same.

We have

\[ R_1 = \frac{1}{2} (3.6 \text{ m})(2200 \text{ N/m}) = 3960 \text{ N} \]

\[ R_2 = (3.6 \text{ m})(1200 \text{ N/m}) = 4320 \text{ N} \]

Then

\[ \pm \sum F_x = 0: \quad B_x = 0 \]

\[ + \sum M_B = 0: \quad -(3.6 \text{ m})A_y + (2.4 \text{ m})(3960 \text{ N}) \]

\[ -(1.8 \text{ m})(4320 \text{ N}) = 0 \]

or

\[ A_y = 480 \text{ N} \]

\[ \sum F_y = 0: \quad 480 \text{ N} - 3960 \text{ N} + 4320 + B_y = 0 \]

or

\[ B_y = -840 \text{ N} \]

\[ A = 480 \text{ N} \]

\[ B = 840 \text{ N} \]