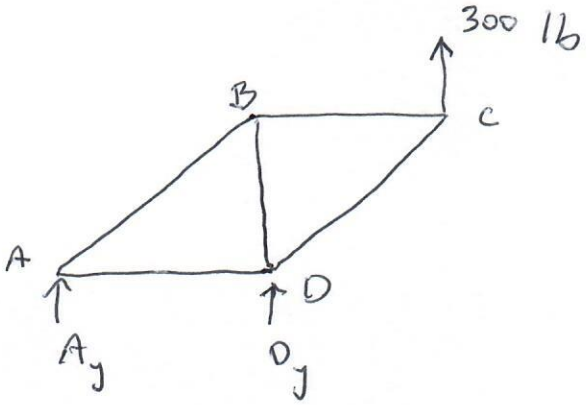
mid-term sol'ns

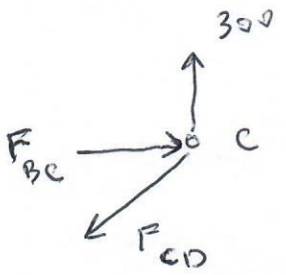
1- $\Sigma M_D = 300 \times 4 - 6 A_y = 0$

$\Rightarrow A_y = 200$ lb

$\Sigma F_y = 0 \Rightarrow D_y = -500$ lb



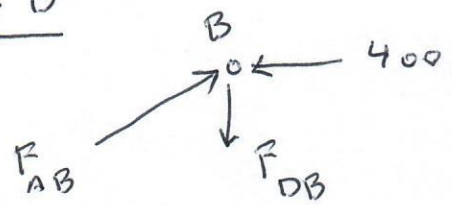
joint C



$\Sigma F_y = 300 - \frac{3}{5} F_{CD} = 0 \Rightarrow F_{CD} = 500$ lb T

$\Sigma F_x = -500 \times \frac{4}{5} + F_{BC} = 0 \Rightarrow F_{BC} = 400$ lb C

joint B

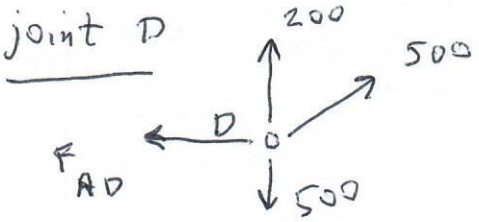


$\Sigma F_x = -400 + F_{AB} \frac{6}{\sqrt{5}} = 0$

$\Rightarrow F_{AB} = 200\sqrt{5} = 447$ lb C

$\Sigma F_y = -F_{DB} + 200\sqrt{5} \times \frac{3}{3\sqrt{5}} = 0 \Rightarrow F_{DB} = 200$ lb T

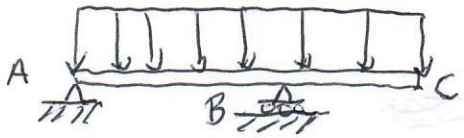
joint D

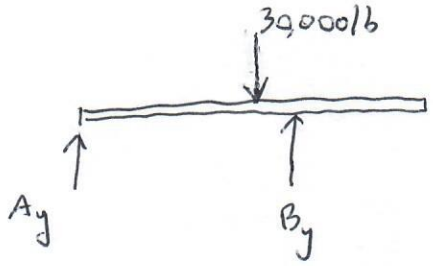


$\Sigma F_x = -F_{AD} + 500 \times \frac{4}{5} = 0$

$\Rightarrow F_{AD} = 400$ lb T

2-





$\Sigma M_A = -30{,}000 \times 15 + 20\,B_y = 0$

$\Rightarrow B_y = 22{,}500$ lb

$\Sigma F_y = 0 \Rightarrow A_y = 30{,}000 - 22{,}500 = 7500$ lb

at $x = 20 \Rightarrow -1000 \times 20 = -20{,}000$ lb

$-20{,}000 + 7500 = -12{,}500$ lb value of shear force at B

$22{,}500 - 12{,}500 = 10{,}000$ lb value of shear force just to the right of B

$\Rightarrow |V|_{max} = 12{,}500$ lb

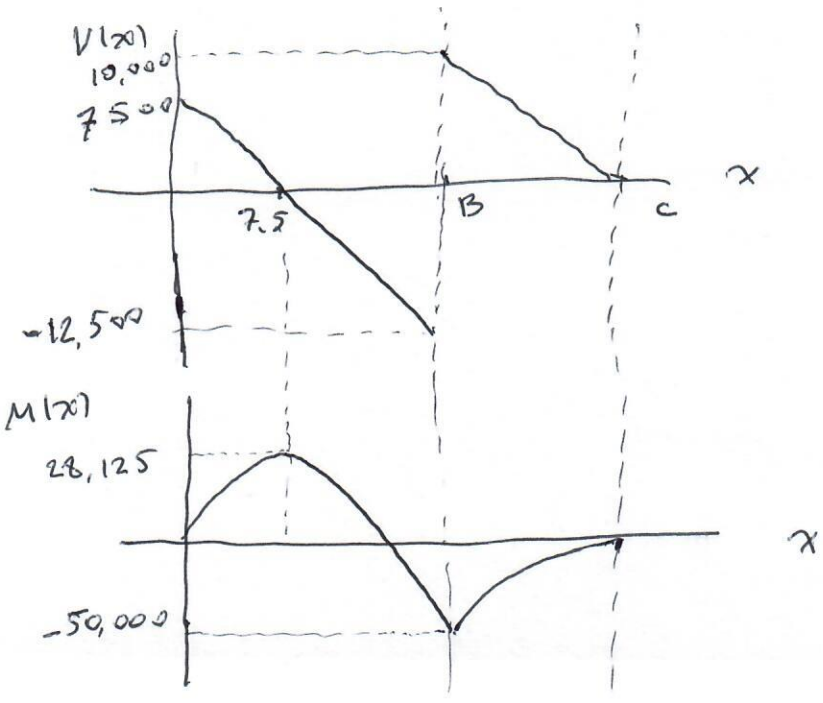
$V = 0 \Rightarrow -1000x + 7500 = 0 \Rightarrow x = 7.5$ in

$\frac{7500 \times 7.5}{2} = 28{,}125$ lb-in value of moment at $x = 7.5$ in

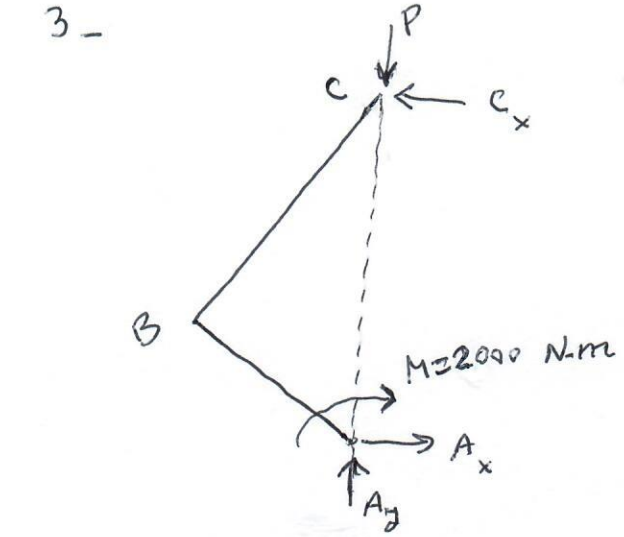
$-\frac{12{,}500 \times 12.5}{2} = -78{,}125$

$-78{,}125 + 28{,}125 = -50{,}000$ lb-in value of moment at B

$\Rightarrow |M|_{max} = 50{,}000$ lb-in

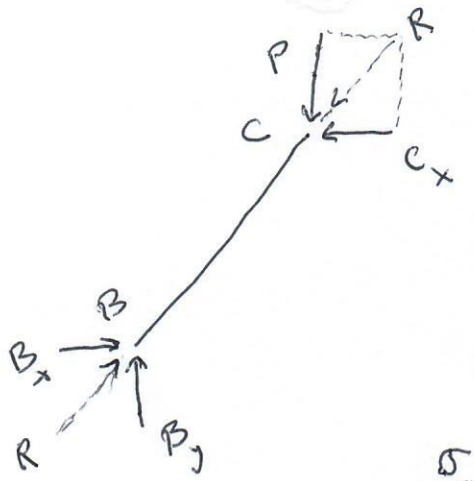


3 -



$$\Rightarrow \Sigma M_A = -2000 + 0.4\, C_x = 0$$

$$\Rightarrow C_x = 5\ kN$$



$$\Rightarrow \Sigma M_B = -0.1\, P + 0.3 \times 5 = 0$$

$$\Rightarrow P = 15\ kN$$

$$R = \left(15^2 + 5^2\right)^{\frac{1}{2}} = 15.81\ kN$$

$$\sigma_{ave} = \frac{15.81}{500 \times 10^{-6}} = 31.6 \times 10^{3} = 31.6\ MPa$$