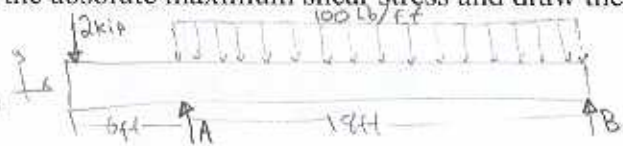
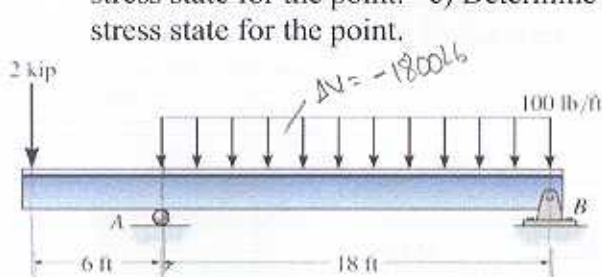


2. The T-beam is subjected to the loading shown. a) Draw the shear and moment diagrams for the beam. b) Determine the absolute maximum bending stress and draw the stress state for the point. c) Determine the absolute maximum shear stress and draw the stress state for the point.



$$\sum M_A = 2000\text{lb}(6\text{ft}) - (100\text{lb/ft})(18\text{ft})(9\text{ft}) + B(18\text{ft}) = 0$$

$$B = 233.33\text{lb}$$

$$\sum F_y = A - 2000\text{lb} - 100\text{lb/ft}(18\text{ft}) + B = 0$$

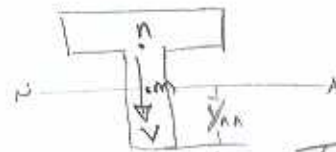
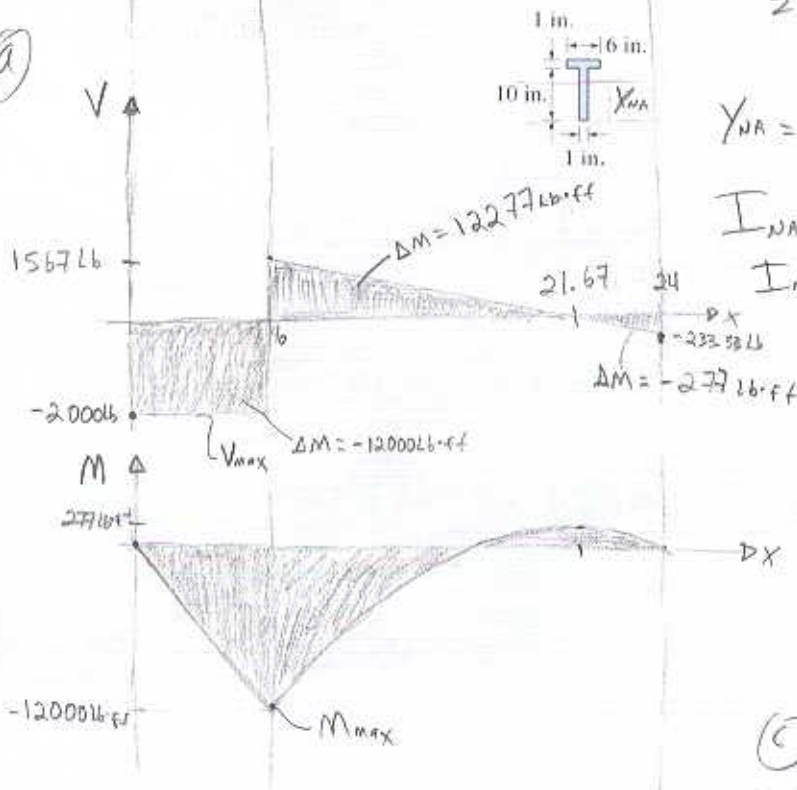
$$A = 3566.67\text{lb}$$

$$Y_{NA} = \frac{1\text{in}(1\text{in})(10\text{in}) + 10.5\text{in}(6\text{in})(1\text{in})}{(1\text{in})(10\text{in}) + (6\text{in})(1\text{in})} = 7.0625\text{in}$$

$$I_{NA} = \frac{1}{12}(1\text{in})(10\text{in})^3 + (1\text{in})(10\text{in})(Y_{NA} - 5\text{in})^2 + \frac{1}{12}(6\text{in})(1\text{in})^3 + (6\text{in})(1\text{in})(10.5\text{in} - Y_{NA})^2$$

$$I_{NA} = 197.27\text{in}^4$$

a)



$$\textcircled{c} V_{max} = 2000\text{lb} \quad \tau = \frac{VQ}{I_{NA}t}$$

$$\tau_{max} = \tau_m = \frac{V_{max}(\frac{Y_{NA}}{2})(Y_{NA})(1\text{in})}{I_{NA}(1\text{in})} = 252.85\text{psi} = \tau_{max}$$

$$\tau_{n_1} = \frac{V_{max}(10.5\text{in} - Y_{NA})(6\text{in})(1\text{in})}{I_{NA}(6\text{in})} = 34.85\text{psi}$$

$$\tau_{n_2} = \frac{V_{max}(10.5 - Y_{NA})(6\text{in})(1\text{in})}{I_{NA}(1\text{in})} = 209.104\text{psi}$$

b) $M_{max} = 12000\text{lb}\cdot\text{ft} = 144000\text{lb}\cdot\text{in}$

$$\sigma = -\frac{My}{I}$$

$$|\sigma_{max}| = \frac{M_{max}(Y_{NA})}{I_{NA}} = 5155\text{psi}$$

