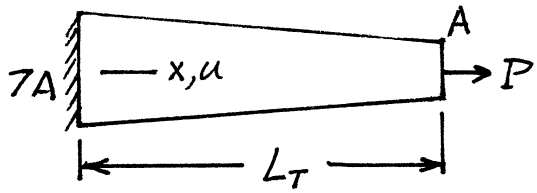
$\boxed{1.3\text{-}1}$

(a)



For $0 \le x \le L_T$,

$$A_x = A\left(7 - \frac{6x}{L_T}\right)$$

and $u = u(x) = \displaystyle\int_0^x \frac{P\,dx}{A_x E} = \frac{P}{EA}\int_0^x \frac{dx}{7 - \frac{6x}{L_T}}$

$$u = \frac{P}{EA}\left[-\frac{\ln(7 - 6x/L_T)}{6/L_T}\right]_0^x$$

$$u = \frac{PL_T}{6EA}\left[\ln 7 - \ln\left(7 - \frac{6x}{L_T}\right)\right]$$

	$x = L_T/3$	$x = 2L_T/3$	$x = L_T$
u	0.0561	0.1412	0.3243

$* \; PL_T/EA$

By FEA:

At $x = L_T/3$, $u = \dfrac{P(L_T/3)}{6EA} = 0.0556\dfrac{PL_T}{EA}$

At $x = 2L_T/3$, $u = 0.0556\dfrac{PL_T}{EA} + \dfrac{P(L_T/3)}{4EA}$

$= 0.1389\dfrac{PL_T}{EA}$

At $x = L_T$, $u = 0.1389\dfrac{PL_T}{EA} + \dfrac{P(L_T/3)}{2EA}$

$= 0.3056\dfrac{PL_T}{EA}$

(b) FEA stresses at element midpoints:

$$\sigma_{1\text{-}2} = \frac{E}{L_T/3}\,0.0556\frac{PL_T}{EA} = 0.167\frac{P}{A}$$

$$\sigma_{2\text{-}3} = \frac{E}{L_T/3}(0.1389 - 0.0556)\frac{PL_T}{EA} = 0.250\frac{P}{A}$$

$$\sigma_{3\text{-}4} = \frac{E}{L_T/3}(0.3056 - 0.1389)\frac{PL_T}{EA} = 0.500\frac{P}{A}$$

These stresses are exact.