

Answers to 3C7: Mechanics of Solids: 2004

1. (b) $u = \frac{\nu\rho g}{E}(h-y)x, v = \frac{\rho g}{E}\left(\frac{y^2}{2} - hy\right) + \frac{\nu\rho gx^2}{2E}$
- (c) $U = \frac{A\rho^2 g^2 h^3}{6E}$
- (d) $u = \frac{\nu\rho g}{E}(h-y)x + \alpha\Delta Tx, v = \frac{\rho g}{E}\left(\frac{y^2}{2} - hy\right) + \frac{\nu\rho gx^2}{2E} + \alpha\Delta Ty$
2. (a)
- $$\sigma_{rr} = -\frac{E\alpha T_o}{4(1-\nu)}\left(1 - \frac{r^2}{b^2}\right),$$
- $$\sigma_{\theta\theta} = -\frac{E\alpha T_o}{4(1-\nu)}\left(1 - \frac{3r^2}{b^2}\right)$$
- $$\sigma_{zz} = -\frac{\nu E\alpha T_o}{2(1-\nu)}\left(1 - \frac{2r^2}{b^2}\right)$$
- (b) $u = \frac{\alpha b T_o (1+\nu)}{2}$
- (c) $T_o = \frac{2(1-\nu)Y}{E\alpha}$
3. (a) $A = -\frac{P}{\pi}$
- (d) $\sigma_{yy}(x, a) = \frac{F}{\pi a}\left(1 - \frac{4}{\left[1 + x^2/a^2\right]^2}\right)$
- 4(a) (ii) $S = \frac{2}{\sqrt{3}}\sigma_Y$
- (iii) $S = \sigma_Y$