

Answers

1 (a) (i) 6 (ii) $-v_k$; 6 ; $v_{j,ji} - v_{i,jj}$

(b) $\phi_0 \approx 30^\circ, \phi_B \approx 15^\circ, \phi_A \approx 45^\circ$

$$\text{at A } \begin{cases} \sigma_{xx} = -157 \text{ MPa} \\ \sigma_{yy} = 43 \text{ MPa} \\ \tau_{xy} = 0 \end{cases}$$

2 (a) $\sigma'_{ij} = \frac{p + \sigma_{zz}}{3} \begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

(b) $\varepsilon_{zz} = \bar{\varepsilon} = \varepsilon_0 \left[\left(\frac{p + \alpha t}{p + \alpha t_1} \right)^{\frac{1}{n}} - 1 \right]$ for $t > t_1$ otherwise 0

3 $\sigma_{rr} = 2A + B(2 \ln r + 1) + \frac{C}{r^2}$; $\sigma_{r\theta} = \frac{D}{r^2}$

(c) $N = (b^2 - a^2)^2 - 4a^2b^2(\ln(b/a))^2$

(d) $\sigma_{\theta\theta} = \frac{4(2n^2 \ln n - n^2 + 1)}{(n^2 - 1)^2 - 4n^2(\ln n)^2} \times \frac{M}{a^2 t}$

$$\sigma_{\theta\theta} = \frac{6M}{(n-1)^2 a^2 t}$$