4.4

解：$\tau = \frac{q}{t}$ 9

$$\tau_1 = \frac{q_1}{2t} = \frac{3}{5} G a \alpha$$

$$\tau_2 = \frac{q_2}{2t} = \frac{7}{5} G a \alpha \quad \frac{7}{10} G a \alpha$$

$$\tau_3 = \frac{q_1 - q_2}{t} = -\frac{1}{5} G a \alpha$$

$$\tau_{max} = \tau_2 = \frac{7}{5} G a \alpha$$

$$= \frac{7}{5} \times 20 \times 10^9 \times 0.1 \times \frac{5}{180} \times \pi$$

$$= 244.34 \text{ MPa} \times \frac{1}{2}$$

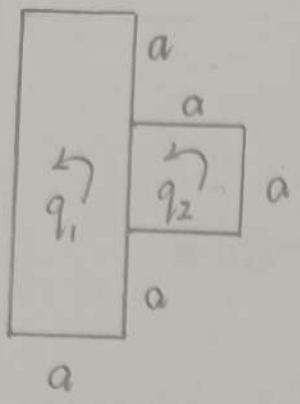
$$= 122.17 \text{ MPa}$$

4.6 10

解：

4.7 6

解:



$T = 2A_1 q_1 + 2A_2 q_2$

$2GA_1\alpha = q_1 \cdot \frac{7a}{t} + (q_1 - q_2) \cdot \frac{a}{t}$

$2GA_2\alpha = q_2 \cdot \frac{3a}{t} + (q_2 - q_1) \cdot \frac{a}{t}$

$A_1 = 3a^2$, $A_2 = a^2$

$\Rightarrow q_1 = \frac{26}{31} aG\alpha t = \frac{13T}{48a^2} = \frac{13 \times 100}{48 \times 0.1^2} = 2708.3$ N/m (1300)

(100)

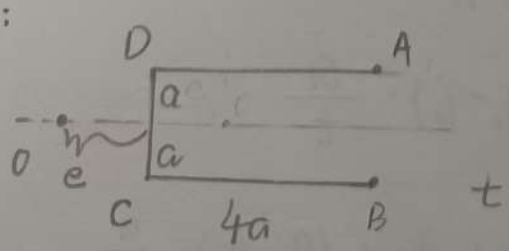
$q_2 = \frac{22}{31} aG\alpha t = \frac{11T}{48a^2} = \frac{11 \times 100}{48 \times 0.1^2} = 2291.7$ N/m (1100)

(100)

$\alpha = \frac{31T}{200Gta^3} = \frac{31 \times 100}{200 \times 20 \times 10^9 \times 5 \times 10^{-3} \times 0.1^3} = 1.55 \times 10^{-4}$ rad/m

4.9 10

解:

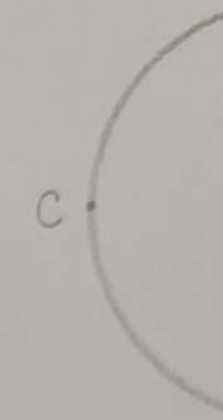


$w_A - w_B = -2\alpha A_s$.

$= \int_s q\,ds$

4.12 10

解:



$w(s) - w_0 =$ ——

$A = \pi R^2 + 2R^2$

$\delta_s = \int_0^s \frac{ds}{t}$

from A to E:

$\delta_s = \frac{R \cdot \alpha}{t}$

$A_s = \frac{1}{2}\alpha R^2 + \frac{R}{2}$

where: $\sin(\alpha - \theta)$

$A\delta_s - A_s\delta =$

$= \frac{R}{t}$

$f(\alpha) = \alpha - \frac{1}{2}s$

$f'(\alpha) = 1 - \frac{1}{2}\cos$