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Engineering Science

M4X02192

Chimney = Hollow cylinder
 $= \pi d h$

$$\pi \times (2.5^2 - 2.4^2) = 1.53 \text{ m}^2$$

Q1	2	9
Q2	10.5	11
Q3	8.5	11
Q4	9	17
	30	48

①

$$k = 1.7 \text{ W/mK}$$

$$h = 12 \text{ W/m}^2\text{K}$$

$$x = 200 \text{ mm} = 0.2 \text{ m}$$

$$T_2 = 68^\circ\text{C} = 341 \text{ K}$$

$$T_1 = 15^\circ\text{C} = 288 \text{ K}$$

$$A = 1.5 \text{ m}^2$$

$$Q = \frac{-1.7 \times 1.53 (341 - 288)}{0.2} = -689.265$$

$$Q = hA(T_2 - T_1) \quad \text{①}$$

$$(12 \times 1.5) \times 53 = -34.64$$

You can't have negative heat transfer.

$$\cancel{-675.75} \quad \cancel{-34.64} = \cancel{-710.39}$$

$$-689.265 - 34.64 = -723.90 \text{ W}$$

KW x .

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②

$$T = 304 \times 10^6$$

$$F = 165000 N$$

$$t = \frac{F}{A} = A = \frac{F}{T} = \frac{165000}{304 \times 10^6} = 542.76 \times 10^{-6} m^2$$

$$542.76 \times 10^{-6} -$$

$$\frac{\pi \times 0.02^2}{4} = 1.13 \times 10^{-4} \text{ units?}$$

$$\text{bolt} = 12 \text{ mm} = 0.012$$

$$542.76 \times 10^{-6} \div 1.13 \times 10^{-4} = 4.8$$

$$= 5 \text{ bolts}$$

10.5

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③

$$G = 78 \text{ GPa} = 78 \times 10^9 \text{ N/m}^2 \quad (1)$$

$$J = \frac{5\sqrt{3}}{8} \times 0.005^4 = 6.77 \times 10^{-10} \text{ m}^4 \quad (1) \quad (0.5)$$

$$L = 0.14 \text{ m} \quad (1)$$

$$T = 10 \text{ Nm}$$

$$\frac{T}{J} = \frac{G\theta}{L} \quad (1)$$

$$\frac{T}{J} = \frac{G\theta}{L} \quad (1)$$

$$\frac{L \times T}{J} = G\theta \quad (1)$$

$$\frac{0.14 \times 10}{6.77 \times 10^{-10}} \div 78 \times 10^9 = 0.026 = 0.03^\circ \quad (1) \quad \text{radians}$$

$$\times \frac{360}{2\pi}$$

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$\frac{BD^3}{12} \rightarrow$ only the D is cubed
 $\downarrow$

$$M = 6200 \text{ Nm}$$

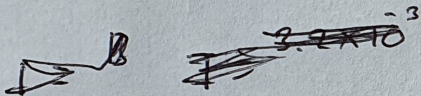
$$E = 210 \text{ GPa} = 210 \times 10^9 \text{ N/m}^2 \quad (1)$$

$$I = \frac{(7.15 \times 10^{-3})^3}{12} - \frac{(3.2 \times 10^{-3})^3}{12} = 2.77 \times 10^{-8} \text{ m}^4$$

~~$BD = 65 \times 110 = 7150 \text{ mm}$~~

$$BD = 0.065 \times 0.11 = 7.15 \times 10^{-3} \quad (1)$$

$$bd = 0.080 \times 0.040 = 3.2 \times 10^{-3} \quad (1)$$



$$I = 2.77 \times 10^{-8} \text{ m}^4$$

$$\frac{2.77 \times 10^{-8} \times 210 \times 10^9}{6200} = 938.22 \times 10^{-3} \text{ m}$$

$$y = 110 = 0.11 = 0.055 \text{ m}$$

$$\frac{M}{I} = \frac{E}{R} \rightarrow \frac{R}{I} = \frac{E}{M} \rightarrow R = \frac{IE}{M} \quad (2)$$

$$R = 938.22 \times 10^{-3} \text{ m}$$

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{My}{I} = \sigma \quad (2)$$

$$\frac{6200 \times 0.055}{2.77 \times 10^{-8}} = 1.23 \times 10^{10}$$

$$1.23 \times 10^{10} \text{ N/m}^2$$