

1. $d = 5 \text{ mm}$

$H = 8 \text{ m}$

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

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

$T_1 = (68 + 273) \text{ K}$

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

$T_2 = (15 + 273) \text{ K}$

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

~~$A = ?$~~ $A = ?$

$Q = -kA(T_2 - T_1)$

$A = \pi r^2 h$

x

$A = 3.14 \times 2.5^2 \times 8$

$A = 157 \text{ m}^2$

$Q = -1.7 \times 157 \times ((15 + 273) - (68 + 273))$

0.2

$Q = 70728.5 \text{ W}$

$Q = 70.73 \text{ kW}$

~~$Q = hA(T_2 - T_1)$~~

$T_2 = (68 + 273) \text{ K}$

$T_1 = (15 + 273) \text{ K}$

$Q = hA(T_2 - T_1)$

$Q = 12 \times 157 \times ((68 + 273) - (15 + 273))$

$Q = 99852$

$Q = 99.85 \text{ kW}$

Date: 30/4/2020

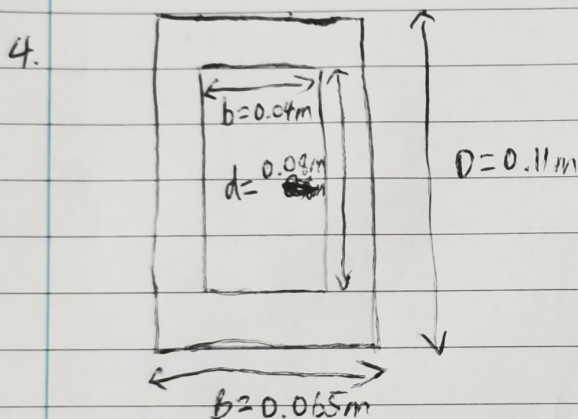
Time: 11:00 am

$$3. \frac{T}{J} = \frac{\theta}{L}$$

$$\frac{TL}{JG} = \theta$$

$$\theta = \frac{10 \times 0.14}{9.73 \times 10^{-5} \times 78 \times 10^9}$$

$$\theta = 1844.68 \text{ radians}$$



$$y = \frac{D}{2} = \frac{0.11}{2} = 0.055 \text{ m}$$

$$I = \frac{bD^3}{12} - \frac{bd^3}{12}$$

$$I = \left[\frac{0.065 \times 0.11^3}{12} \right] - \left[\frac{0.04 \times 0.08^3}{12} \right]$$

$$I = 5.5 \times 10^{-6} \text{ m}^4$$

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

$$\sigma = ?$$

$$E = 210 \times 10^9 \text{ N/m}^2$$

$$R = ?$$

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$$

$$\frac{M}{I} = \frac{E}{R} \rightarrow \cancel{MR = EI} \quad MR = EI$$

$$R = \frac{EI}{M}$$

Xingjie Yu

Student number: 1901221

Date: 30/4/2020

Time: 11:00am

2. $A = 12\text{mm} = 0.012\text{m}$ $d = 12\text{mm} = 0.012\text{m}$

$$F = 165\text{ kN} = 165 \times 10^3\text{ N}$$

$$\gamma = 304\text{ N/m}^2 = 304 \times 10^6\text{ N/m}^2$$

$$\text{Area of 1 bolts} = \frac{\pi d^2}{4} = \frac{\pi \times 0.012^2}{4} = 1.13 \times 10^{-4}\text{ m}^2$$

$$\gamma = \frac{F}{A}$$

$$A = \frac{F}{\gamma}$$

$$\text{Area to support load} = \frac{F}{\gamma} = \frac{165 \times 10^3}{304 \times 10^6} = 542.76 \times 10^{-6}\text{ m}^2$$

$$\text{No of bolts} = \frac{542.76 \times 10^{-6}}{1.13 \times 10^{-4}} = 4.8 = 5\text{ bolts}$$

3. $G = 78\text{ G N/m}^2 = 78 \times 10^9\text{ N/m}^2$

$$s = 5\text{mm} = 0.005\text{ m}$$

$$L = 140\text{mm} = 0.14\text{ m}$$

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

$$\theta = ?$$

$$J = \frac{5\sqrt{3}}{8} \times 0.005^4 = 9.73 \times 10^{-15}\text{ m}^4$$

$$\frac{T}{J} = \frac{\gamma \theta}{L}$$

Xingjie Yu

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Module code: M4X02192

$$R = \frac{210 \times 10^4}{6200} \times 5.5 \times 10^{-6}$$

$$R = 186.29 \text{ m}$$

$$\frac{M}{I} = \frac{\sigma}{Y}$$

$$\frac{MY}{I} = \sigma$$

$$\sigma = \frac{6200 \times 0.055}{5.5 \times 10^{-6}}$$

$$\sigma = 62 \times 10^6 \text{ N/m}^2$$