

HND/BSc Science M4X02192
Sem 2 2018-2019

1. $A = 600\text{mm} \times 455\text{mm}$
 $A = 0.6 \times 0.455$ ①
 $A = 0.273\text{m}^2$ ①
 $h = 1100\text{W/m}^2\text{K}$ ①
 $Q = 55000\text{W}$ ①

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

$$(T_2 - T_1) = \frac{Q}{hA}$$
 ①
$$(T_2 - T_1) = \frac{55000}{1100 \times (0.273)}$$
 ①
$$T_2 - T_1 = \underline{183.15^\circ\text{C}}$$
 ①

2.

a) $\tau = \frac{F}{A} = \frac{250}{(0.4 \times 0.025)}$ ① = 25000N/m^2 ①

b) $\gamma = \frac{x}{l} = \frac{2 \times 10^{-3}}{0.1}$ ① = 0.02 (no units) ①

c) $G = \frac{\tau}{\gamma} = \frac{25000}{0.02} = 125000\text{N/m}^2$ ①

3. $l = 0.75\text{m}$
 $T = 1200\text{Nm}$
 $\theta = 0.0005\text{radians}$
 $G = 210 \times 10^9\text{N/m}^2$ ①
 $D = ?$

$$\frac{T}{J} = \frac{G\theta}{l}$$
 ①
$$\frac{Tl}{G\theta} = J$$
 ①

$$J = \frac{(1200 \times 0.75)}{(210 \times 10^9 \times 0.0005)} = 8.57 \times 10^{-6}\text{m}^4$$
 ①

$$J = \frac{\pi d^4}{32}$$

$$D = \sqrt[4]{\frac{32J}{\pi}} = \sqrt[4]{\frac{32 \times 8.57 \times 10^{-6}}{\pi}}$$

$$D = 0.0966 \dots = 0.10 \text{ m.}$$

$$A. \quad \sigma = \frac{F}{A} = \frac{F}{\left(\frac{\pi d^4}{4}\right)} = \frac{273}{\left(\frac{\pi \times (5 \times 10^{-3})^2}{4}\right)} = 1.54 \times 10^6 \text{ N/m}^2$$

$$\epsilon = \frac{x}{l} = \frac{0.0035 \times 10^{-3}}{0.25} = 1.4 \times 10^{-5} \text{ (no units)}$$

$$E = \frac{\sigma}{\epsilon} = \frac{1.54 \times 10^6}{1.4 \times 10^{-5}} = 110 \times 10^9 \text{ N/m}^2$$