



**Complete, fold and seal
(see note 2 below)**

Dawid

Coreu

12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	1702838
2	Title of Examination Paper	Engineering Science
3	Module Code	m4x02142
4	Date and Time of Examination	3/5/19 11:00 am
5	Examination Venue	106
6	Seat Number	
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
All 1 3 8	
2 3.5 11	
3 1.5 16	
4 4.5 10	
Total	12.5 39

Inv'd Tim Tudor

32%.



1) $h = 400 \text{ W/m}^2\text{K}$ $55 \text{ kW} \times 1000 = 55000 \text{ W}$ ✓ ①
 $A = 600 \times 10^3 \times 465 \times 10^3$
 $A = (0.6 \times 0.465)$
 $A = 0.279 \text{ m}^2$ ✓ ②

$$Q = h A (T_2 - T_1)$$

$$Q = 55 \times 0.279^2 (1045) \quad ?$$

$$Q = 4473911.475$$

$$Q = 4.47 \times 10^6 \text{ W/m}^2\text{K} \quad \times \text{ Shame.}$$

3/8

2) $F = 250 \text{ N}$
 $x = 2 \text{ mm} \times 10^{-3}$

a) $T = \frac{F}{A}$

$$A = (0.4 \times 0.1 \times 0.025)$$

$$A = 1 \times 10^{-3} \quad 0.001^2$$

That's a volume.

$$T = \frac{250}{1 \times 10^{-3}} \quad ①$$

$$T = 250 \times 10^6 \text{ N/m}^2 \quad ② \text{ Shame.}$$

X.

b) $y = \frac{x}{L}$

$$y = \frac{2 \times 10^{-3}}{400} \quad \checkmark \quad ①$$

$$y = 5 \times 10^{-6} \text{ (no units)} \quad ②$$

c) $G = \frac{250 \times 10^6}{5 \times 10^{-6}}$

$$G = 5 \times 10^{13} \text{ N/m}^2$$

Carried error.

②

3.5/11

$$3) L = 0.75 \text{ m}$$

$$T = 1200 \text{ Nm} \times 1000 = 1200000 \text{ N} \quad \times$$

$$r = 0.0005$$

$$G = 210 \text{ GPa/m}^2 \times 1000 = 210000 \text{ N/m}^2$$

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

$$\frac{I}{J} = \frac{T}{r} = \frac{G\theta}{L}$$

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

$$J = \frac{3.14 \times 0.75^4}{32}$$

$$J = 0.031 \text{ m}^4 \times 0.5$$

$$\frac{I}{J} = \frac{T}{r} = \frac{G\theta}{L}$$

$$\frac{I}{J} = \frac{T}{r} \leftarrow \text{Rearrange for } (T)$$

$$T \cdot r = J \frac{G\theta}{L}$$

$$T = \frac{J \cdot G \cdot \theta}{L \cdot r}$$

①

$$T = \frac{1.2 \times 10^6 \times 0.0005}{0.031}$$

$$T = 19354.83871$$

$$T = 19.35 \times 10^3 \text{ N/m}^2 \quad \times$$

$$d = \frac{\pi D^2}{4}$$

1.5/10

$$4) F = 273 \text{ N}$$

$$x = 0.0035 \text{ mm} \times 10^{-3} \quad 3.5 \times 10^{-6} \text{ m}$$

$$L = 0.25$$

$$d = 15 \text{ mm} \times 10^{-3} \quad 0.015 \text{ m}$$

$$E = \frac{x}{L}$$

$$E = \frac{3.5 \times 10^{-6}}{0.25}$$

$$E = 1.4 \times 10^{-5} \text{ N/m}^2 \text{ (no units)} \quad \checkmark (3)$$

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

$$A = \pi r^2$$

$$A = 3.14 \times 7.5 \times 10^{-3}^2$$

$$A = 1.76 \times 10^{-4} \text{ m}^2$$

you have used the diameter
 $\frac{d}{2} = r$ the radius.

$$\sigma = \frac{273}{1.76 \times 10^{-4}}$$

$$\sigma = 1551136.364$$

$$= 1.55 \times 10^6 \text{ N/m}^2$$

(0.5)

Shame!

$$E = \frac{\sigma}{\epsilon}$$

$$E = \frac{1.55 \times 10^6}{1.4 \times 10^{-5}}$$

$$E = 1.107142857 \times 10^{11}$$

(1)

Carried error.

4.5/10

Question No.

Examiner O

Arholwr yn unig

ff y Cwestiwn

Question No.

Examiner Only

Rhif y Cwestiwn

Arholiwr yn un

Question No.

Examiner Onl

Arholwr yn unig

Rhif y Cwestiwn

Question No.

Examiner Only

Question No.

Examiner On

Arholwr yn unig

Shif y Cwestiwn

Question No.

Examiner Only

Arholwr yn unli

Rhif y Cwestiwn

Question No.

Examiner Or

Arholwr yn unig

niŵ y Cwestiwn

