Connor Griffiths GRI14824119 **43%**

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

LOCATION: SWANSEA **LLEOLIAD: ABERTAWE**

LEVEL 4 **LEFEL 4**

EXAMINATION PERIOD **CYFNOD ARHOLIADAU**
MAY 2020 **MAI 2020**

MODULE CODE: M4X00385
ENGINEERING SCIENCE 1

TIME: 2 HOURS

ANSWER ALL QUESTIONS IN SECTION

Equipment or materials required – Scientific Calculator + Formula Booklet

Adnoddau neu ddefnyddiau sydd eu hangen -Scientific Calculator + Formula Booklet

Conor Grifitths	Q1 [20]	Q2 [20]	Q3 [20]	Q4 [15]	Q5 [25]
	ai. 5	a.i 0	0	a. 0	a.i 4
	ii. 5	ii. 0		b.0	ii. 2
	b.i.5	iii. 0		c. 5	iii. 5
	ii.5	b. 5			b.i 2
					ii. 0
					Total 43

Conor Griffiths - GRI14824119 18/5/20
9:00

Engineering Science 1 - MAK00385.

1a) Stress = $\frac{\text{force}}{\text{Cross Section}}$

$120\text{mpa} = \frac{90\text{KN}}{(2.015 \times 6)}$

$b = 90000 / 1200000 / 0.015 = 0.05\text{mm} = 50\text{mm}$

ii) Cross Section = $0.015 \times 0.05 = 0.0007\ \text{sm}^2$.

$L = 1.5$

$F = 90\text{KN}$

Extension = 0.0035m

mod elasicity = 51.429gpa.

Conor Griffiths - GRI14824119 18/5/20 9:00

Engineering Science Exam - M4X00385

Question One

bi) I/D - 130mm
O/D - 140mm

Supports a load of 8KN

Tube o/L = 450mm

$A = \frac{\pi}{4} (130^2 - 140^2) mm^2$

$\frac{\pi}{4} = 0.785$

$140^2 - 130^2 = 2700mm$

$0.785 \times 2700 = 2119.5 \times 10^{-3} = 2.12$

$Stress = \frac{F}{A} = \frac{8KN}{2.12} = 3.77Mpa.$

ii) ~~$\frac{8 \times 10^3}{2.1195 \times 10^{-3}} = 3.77 \times 10^6 = 3.77$~~

mod of elasticity = 96 GPa $E = \frac{FL}{A \Delta L}$ $96GPa =$

$= \frac{8 \times 10^3 \times 450 \times}{2.1195 \times 10^{-3} \times}$

$2.1195 \times 10^{-3} \times \Delta L = \frac{8 \times 10^3 \times 450 \times 10^{-3}}{96 \times 10^9}$

$= 17.084 \times 10^{-6}$

$\Delta L = \frac{8 \times 10^3 \times 450 \times 10^{-3}}{96 \times 10^9 \times 2.1195 \times 10^{-3}}$

Conor Griffiths - GRI14824119
Engineering Exam - M4X00385.

18/5/20
9:00

Question 1

b)
ii) $E = \frac{\sigma}{\varepsilon} = \frac{FL}{Ax}$

$\therefore x = \frac{FL}{AE} = \frac{(8\times10^{3}) \times (450\times10^{-3})}{(2.12\times10^{-3}) \times (96\times10^{9})}$

$x = 1.769\times10^{-5}\,m$

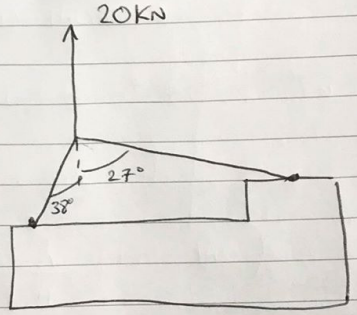
$x = 0.018\,mm.$

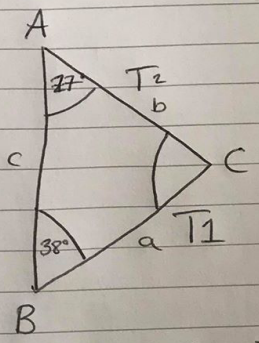
Conor Griffiths - GRI14824119 18/5/20 9:00

Engineering Science Exam - M4X00385.

Question 2

b)





Angle C = 180° - 27° - 38°
= 115°

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{T1}{\sin 27^\circ} = \frac{T_2}{\sin 38^\circ} = \frac{20KN}{\sin 115^\circ}$$

Solve for T1

$$T1 = \frac{20 \sin 27^\circ}{\sin 115^\circ} KN = 10KN$$

Solve for T2

$$T_2 = \frac{20 \sin 38^\circ}{\sin 115^\circ} = 13.59KN$$

Conor Griffiths - GRI14824119 18/5/20 9:00

Engineering Science Exam - M4X00385.

Question 4

a) $P = T \times S$

$23.87 Nm \times 1000 = 2.38 kw.$

b) $5 Hp \rightarrow 3.7285 Kw$

$\frac{3.7285}{14.5} = 0.527$ rpm.

c) work done = $10MJ = 10 \times 10^6 J$

torque = $4KN/m = 4000 Nm$

Angler displacement

$\theta = \frac{10 \times 10^6}{4000} = 2500$ $\quad 2\pi rev = 1 rev$

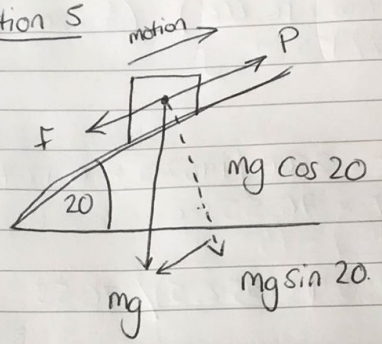
$\frac{2500}{2\pi} = 397.89$ revs

Conor Griffiths - GRI14824119 18/5/20
9:00

Engineering Science Exam - M4X00385.

Question 5

ai)



$g = 9.81 m/s^2$
mass = 30kg
$\mu = 0.3$

iii) $30 \times 9.81 \cos 20 = N$
$N = 276.55N$

$F = \mu N$
$F = 0.3 \times 276.55$
$F = 82.965.$

$F = P + mg \sin 20$
$P = F - mg \sin 20$

$P = 82.965 - (30 \times 9.81) \sin 20.$

$P = -17.692.$

B) mass 2 ton = 2000kg = 2000 × 9.81 = 1970w

V_1 = 60km/h = (60 × 1000) / 3600 = 16.666 m/s

V_2 = 25 Km/h = (25 × 1000) / 3600 = 6.944 ms.

i) linear energy → $(\frac{1}{2} \times 2000 \times 16.666^2) - (\frac{1}{2} \times 2000 \times 6.944^2)$

= 22955.5 J.

ii) force = w/T

if f = ma, ∴ Acc = 2500 / 19620 = 0.127 m/s^2

16.66 - 6.94 / 0.127 = 76.55 sec

force required = 229 552.5 / 76.55 = 3000N

= 3KN