

LEVEL 4 ASSESSMENT SPECIFICATION

Student name:	<i>Callum John</i>	Student ID number:	<i>150 598</i>
Programme:	HNC Mechanical Engineering		
Module:	Mechanics 1		
Module code:	PSDM 4002	Contribution to Overall Module Assessment (%):	20%
Lecturer:	P R Taylor	Internal Verifier:	L Rutherford
Assignment Title:	CW2 TCA open book test	Word count (or equivalent):	N/A
Submission deadline:	22 April 2021	Return date of provisional marks & written feedback:	
Submission method:	All written assessments, where practical and possible, must be submitted via Turnitin unless otherwise instructed by the Lecturer. (Please DO NOT put this assessment specification into Turnitin or it will match many similarities with other students' submissions.) Alternative submission method (if applicable): Late submission of the assessment will result in a late penalty mark. Penalties for late submission: Up to one week late, maximum mark of 40%. Over one week late, 0%. Only the Extenuating Circumstances Panel may approve a change to submission dates.		
Academic honesty / referencing:	Academic honesty is required. In the main body of your submission you must give credit to authors on whose research and ideas your work is based. Append to your submission a reference list that indicates the books, articles, etc. that you have used, cited or quoted in order to complete this assessment.		

Question 1

a) Load 150 kN

$$\begin{aligned}
 \text{i)} \quad \text{Stress} &= F/A = \frac{\text{Force}}{\text{Area}} = \frac{150 \times 10^3}{25 \times 10^{-6}} \\
 &= \frac{150 \times 10^3}{25 \times 10^{-6}} = 6 \times 10^9 \text{ N/m}^2 \\
 \text{Area} &= \frac{F}{\text{Stress}} \\
 \phi &= 2 \times \sqrt{A/\pi} = 2 \times \sqrt{(0.006 \times \pi)} \\
 &= 0.087 \text{ m}
 \end{aligned}$$

$$\begin{aligned}
 \text{ii)} \quad \epsilon &= \sigma / E \\
 200 \times 10^9 &= 250 \times 10^6 / \epsilon \quad \epsilon = \frac{250 \times 10^6}{200 \times 10^9} = 0.125 \times 10^{-3} \\
 \text{Strain} &= x/L = 0.125 \times 10^{-3} = 2 \times 10^{-4} / L
 \end{aligned}$$

$$L = \frac{x}{\text{Strain}} = \frac{2 \times 10^{-4}}{0.125 \times 10^{-3}} = 16 \text{ mm} \quad 1.6 \text{ m}$$

b) Hole 15 mm Rad in 2 mm sheet UTS = 55 MN/m²

$$\text{Area of } \bigcirc = \pi \times 0.015^2 = 7.069 \times 10^{-4} \text{ m}^2$$

$$\frac{55}{7.069 \times 10^{-4}} = 77.8 \text{ kN}$$

10

✓

b)

Shear stress

$$\tau = F/A = L \times A = F$$

only cut circumference

$$r_2 = d$$
$$15 \times 2 = d = 30 \text{ mm}$$
$$= 0.03$$

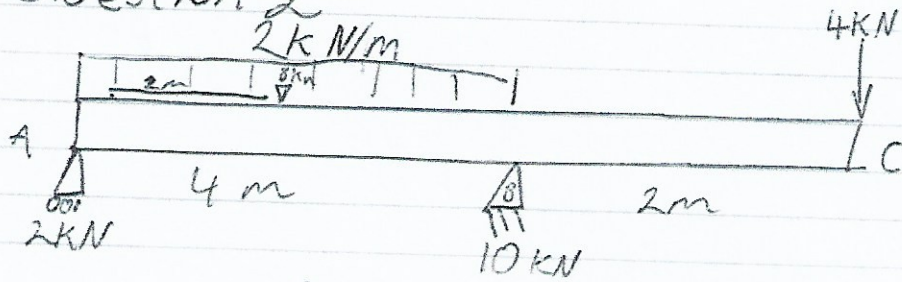
$$A = \pi \times d \times \text{thickness}$$

$$\text{thickness} = 2 \text{ mm} = 0.002 \text{ m}$$

$$A = \pi \times 0.03 \times 0.002 = 188.496 \times 10^{-6} \text{ m}^2$$

$$F = 55 \times 10^6 \times 188.496 \times 10^{-6} = 10.37 \text{ kN}$$

Question 2



$$\Sigma M_A = 0 \quad (\cancel{4000 \times 1.5} + \cancel{1000 \times 2.5} - 5(6m))$$

UD load into point load =
 $2000\text{N} \times 4\text{m} = 8\text{KN/m}$
 load is situated half way on the UD so
 at 2m from A

$$(8 \times 2) + (6 \times 4) = 16 + 24 = 40$$

$$\sum m a = 0$$

$$(8 \times 2) - (3 \times 4) + (4 \times 6) = 0$$

$$16 - 12 + 24 = 0$$

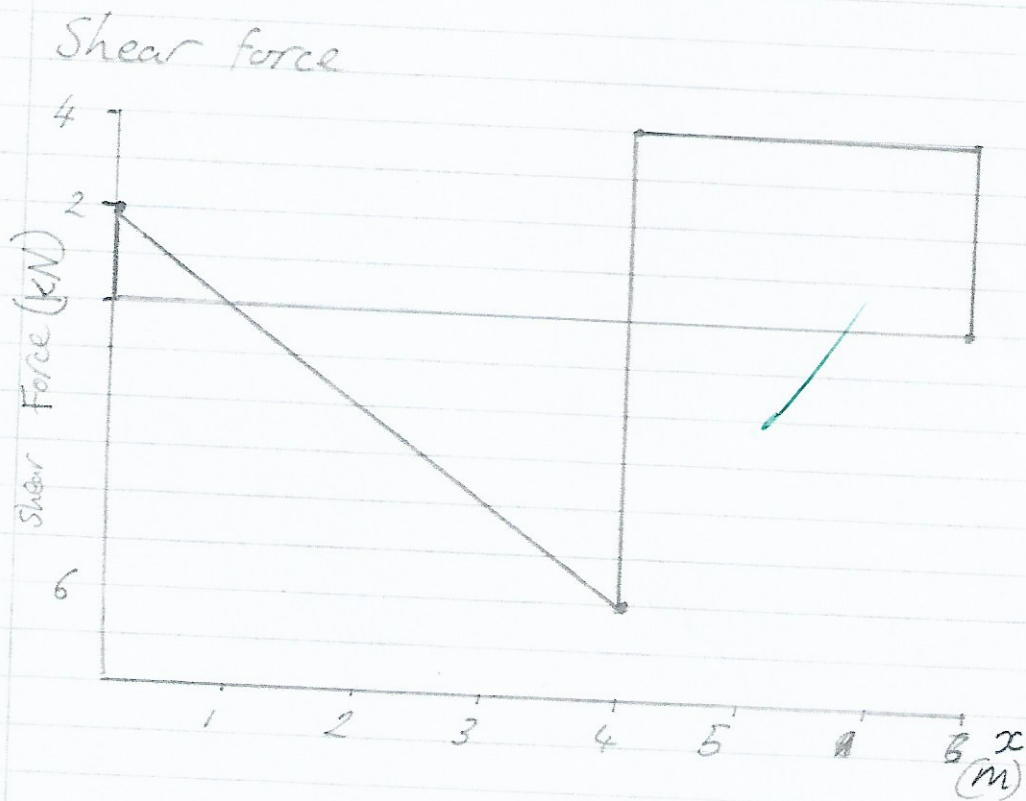
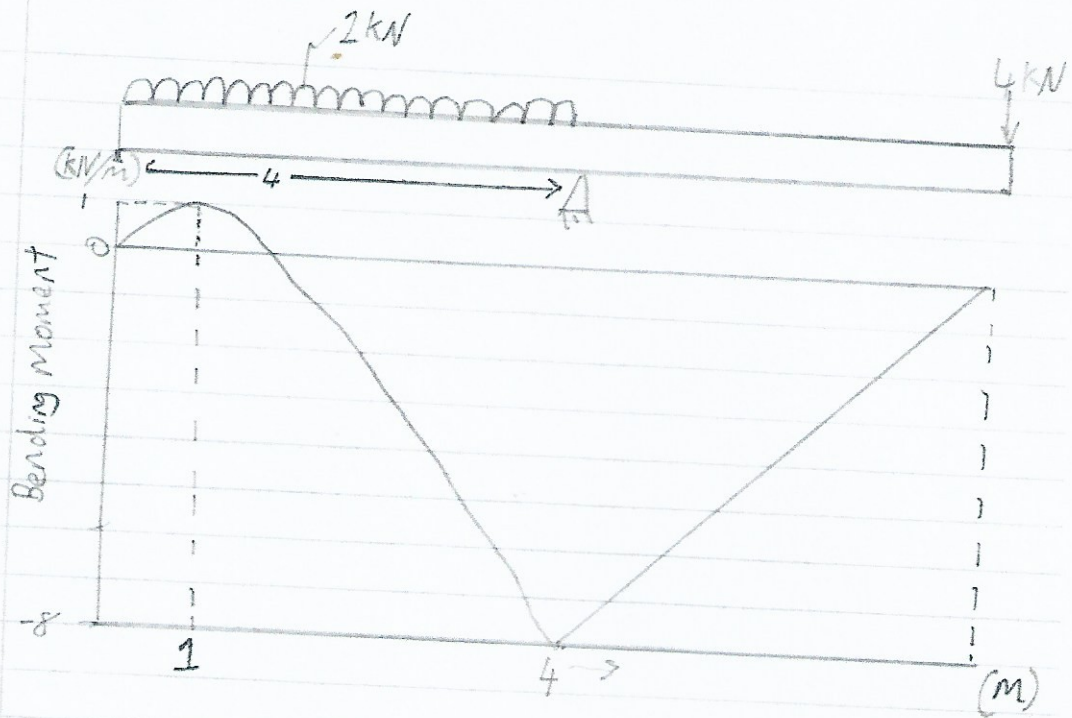
$$16 - 4B \neq 24 = 0$$

$$24 + 16 = 40$$

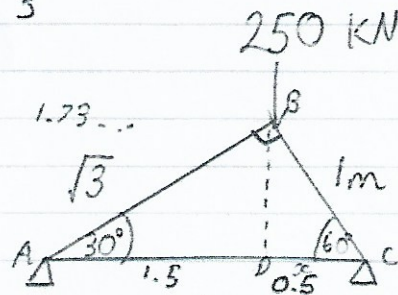
$$24 + 16 = 40$$

$$\frac{40}{4} = B = 10 \text{ kN}$$

$$A - 8 + 10 - 4 = 0 \quad A = 8 - 10 + 4 = 2 \text{ kN}$$



Question 3



$$\cos 60 = \frac{x}{1} \quad x = \cos 60 = 0.5$$

$$\sqrt{BC^2 - CD^2} = BD$$

$$\sqrt{1^2 - 0.5^2} = 0.866 \text{ m}$$

$$AC = \sqrt{(\sqrt{3})^2 + 1^2} = 2 \text{ m}$$

$$\sum m = 0 \text{ N}$$

$$2 R_L - 1.5 \times 250 = 0 \text{ N}$$

$$R_L = \frac{1.5 \times 250}{2} = 187.500 \text{ N}$$

$$\sum F_y = 0$$

$$R_R + 187.5 - 250 = 0$$

$$R_R = 250 - 187.5 = 62.5 \text{ N}$$

$$\frac{125}{\sin(30)} - 62.5 = -125 = \text{AB strut}$$

$$AC \text{ chord} = 125 \cos 30 = 320 \text{ (Tension)}$$

$$CB = \frac{187.5}{\sin(60)} = 216.5 \text{ Tie}$$

5 ft x 1 ft (compressive)

$$CD = 216.5 \cos(60) = 108.25 \text{ (Tie)} \checkmark$$