

APPENDIX GA36a

LEVEL 4 ASSESSMENT SPECIFICATION

Student name:	Jordan James		Student ID number:	
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.			

14, i) Stress = $\frac{\text{Force}}{\text{Area}}$

$$25 \times 10^6 = \frac{150 \times 10^3}{\frac{\pi D^2}{4}}$$

$$\frac{\pi D^2}{4} = \frac{150 \times 10^3}{25 \times 10^6}$$

$$\pi D^2 = \left(\frac{150 \times 10^3}{25 \times 10^6} \right) \times 4$$

$$D = \sqrt{\frac{0.024}{\pi}}$$

$$D = 0.087 \text{ m or } 87 \text{ mm}$$

Diameter of bar is 87 mm

Find out strain
Young's modulus

$$E = \sigma / \epsilon$$

$$200 \times 10^9 = \frac{250 \times 10^6}{\epsilon}$$

$$\epsilon = \frac{25 \times 10^6}{200 \times 10^9} = 0.125 \times 10^{-3}$$

$$\text{Strain} = \Delta / L$$

$$0.125 \times 10^{-3} = \frac{0.0002}{L}$$

$$L = \frac{0.0002}{0.125 \times 10^{-3}} = 1.6 \text{ m}$$

Length of bar = 1.6 m

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b) Shear stress = $\tau = F/A$
 $F = \tau \times A$

Cut to be made at area circumference

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

$$\bar{A} = 0.03 \times \pi \times ~~0.002~~ 2 \times 10^{-3}$$

$$A = 188.496 \times 10^{-6}$$

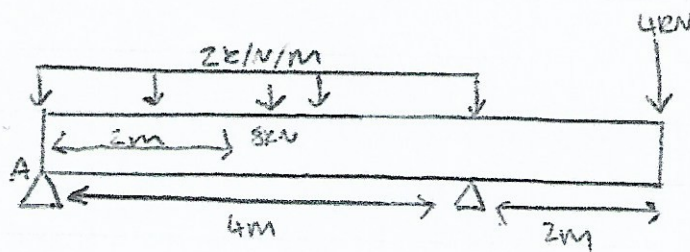
Sub into formula

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

$$F = 10.367 \text{ kW}$$

The force required to punch the hole is 10.367 kW

2)



$$\sum M_A = 0$$

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convert UDL into point load

$$(2 \times 10^3) \times 4 = 8000 = 8 \text{ kN}$$

8 kN @ 2m from the left

$$\sum M_A = 0$$

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

$$= 16 - R_R \times 4 + 4 \times 6 = 0$$

$$16 + 24 = R_R \times 4$$

$$\frac{40}{4} = R_R$$

$$\underline{10 \text{ kN} = R_R}$$

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$$\sum F_y = 0$$

$$R_L - 8 + 10 - 4 = 0$$

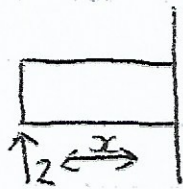
$$R_L = 8 - 10 + 4$$

$$\underline{R_L = 2 \text{ kN}}$$

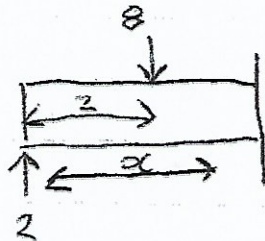
Calculating bending moments Equations

$$0 < x < 2$$

$$B.M = 2x$$



$$2 < x < 4$$



$$B.M = 2x - 8(x-2)$$

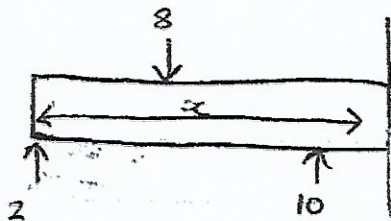
$$B.M = 2x - 8x + 16$$

$$B.M = -6x + 16$$

$$B.M = 2x - 8(x-2) + 10(x-4)$$

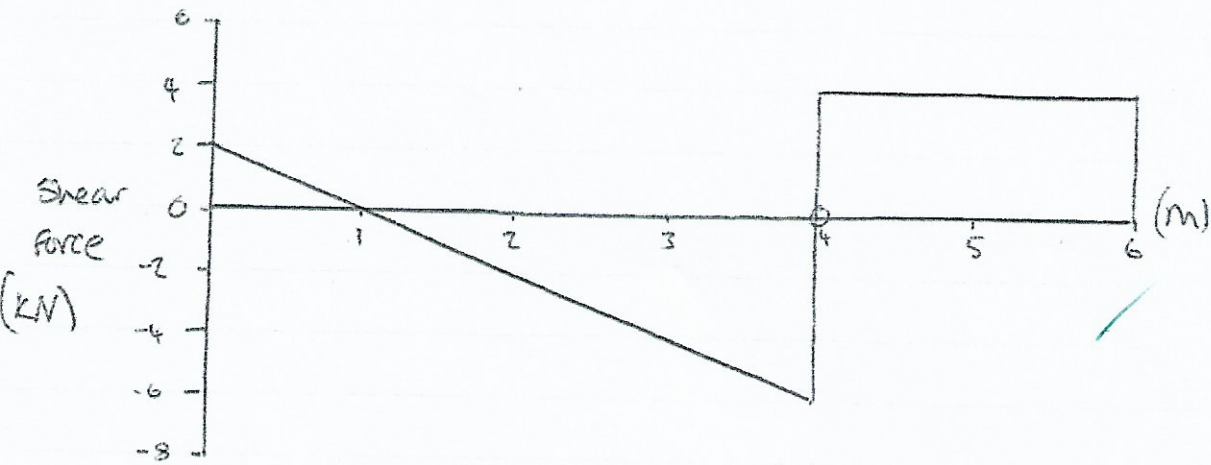
$$B.M = 2x - 8x + 16 + 10x - 40$$

$$B.M = 4x - 24$$

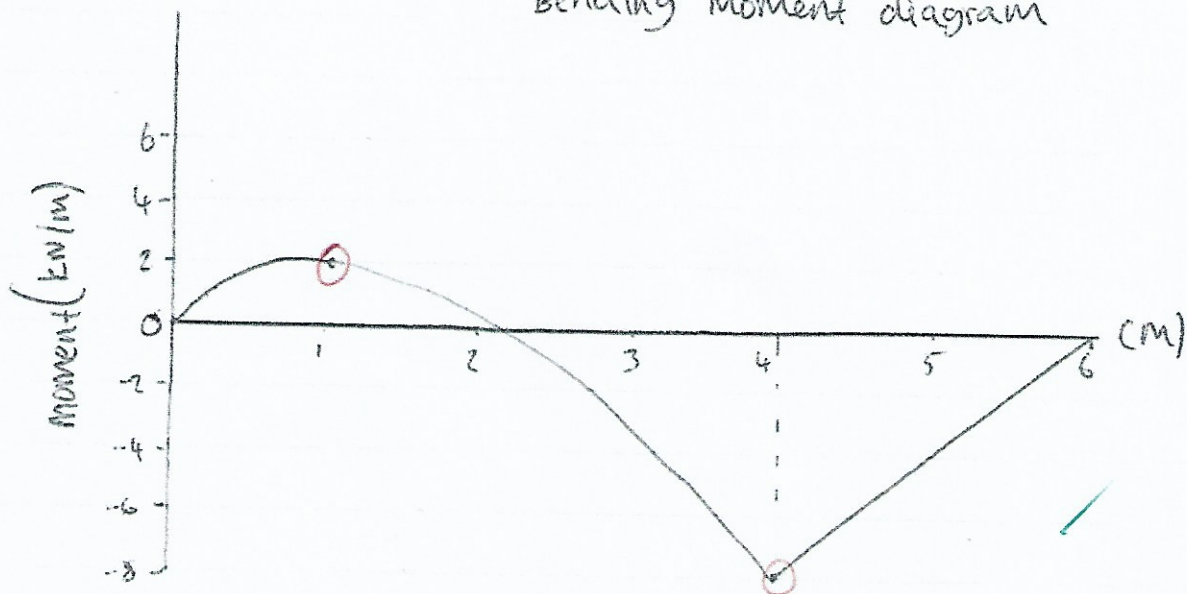


$$B.M =$$

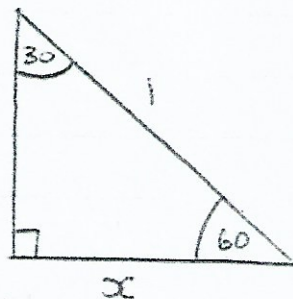
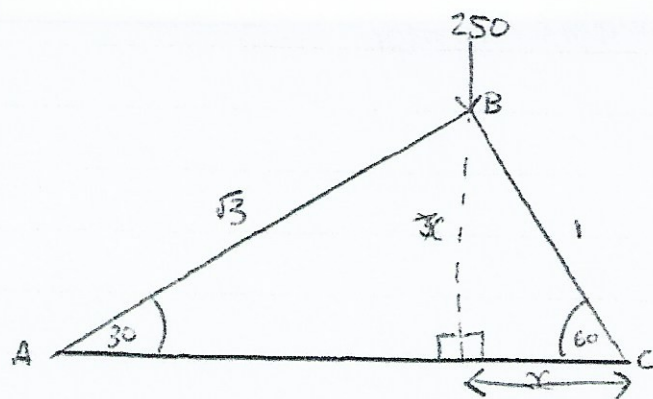
Shear force diagram



Bending moment diagram



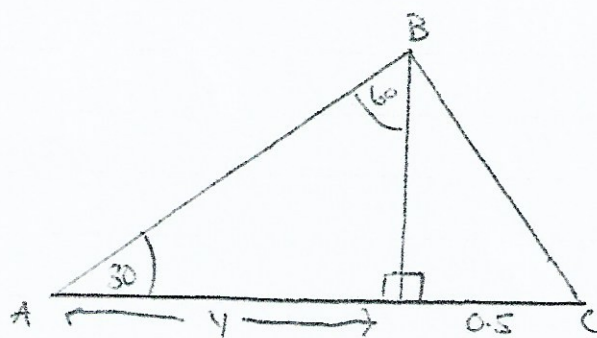
3)



SOMCANTOA

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

$$x = 1 \times \cos 60 = 0.5 \text{ m}$$



$$\tan(30) = \frac{0.5}{y}$$

$$y = \frac{0.5}{\tan(30)}$$

$$y = 0.87 \text{ m}$$

Full length = 1.37 m

$$\sum M_A = 0$$

$$1.37 R_R - 250 \times 0.87 = 0$$

$$R_R = \frac{250 \times 0.87}{1.37}$$

$$R_R = 158.7 \text{ N}$$

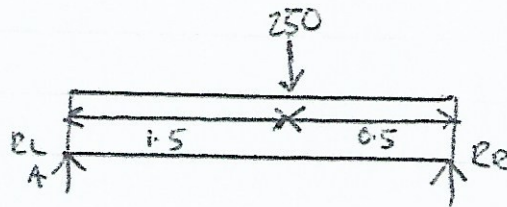
$$\sum F_y = 0$$

$$158.7 - 250 + R_L = 0$$

$$R_L = -158.7 + 250$$

$$R_L = 91.3 \text{ N}$$

Finding reactions



$$\sum M_A = 0$$

~~$$2R_R - 250 \times 1.5 = 0$$~~

~~$$2R_R - 375 = 0$$~~

~~$$R_R = 375/2 =$$~~

~~$$R_R = 187.5N$$~~

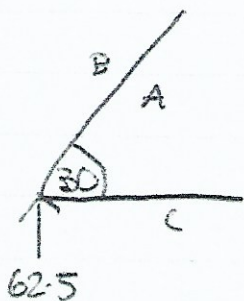
$$\sum F_y = 0$$

$$R_L - 250 + 187.5 = 0$$

$$R_L = 250 - 187.5$$

$$R_L = 62.5N$$

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$$\sum F_y = 0$$

$$62.5 + BA \sin 30 = 0$$

$$BA = \frac{-62.5}{\sin 30} = -125N \text{ strut}$$

$$\sum F_x = 0$$

$$AC - 125 \cos 30 = 0$$

$$AC = 125 \cos 30$$

$$AC = 108.25 \text{ Tie}$$

Internal force on AC = 108.25N and is a tie which means a tensile force is acting.

Internal force on AB = 125N and this force is compressive.