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Module: Engineering Maths

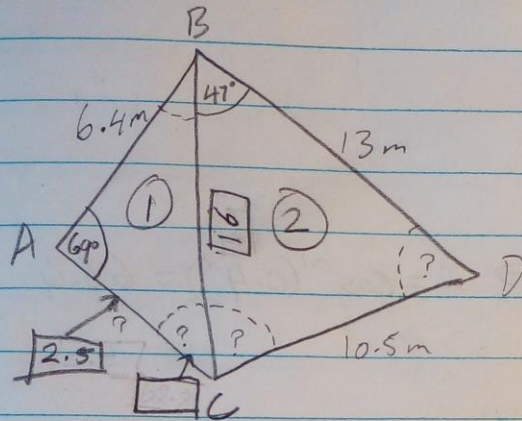
Module code: ACBA4007

Assignment Title: Exam

Lecturer: Dr Jamiu A. Dauda

40%

Section A



1) Find all sides and all angles

Shape 1

a) $\cos 69^\circ = \frac{\text{Adj}}{\text{hyp}}$ x

$\cos 69^\circ = \frac{6.4}{\text{hyp}}$

$0.46 = \frac{6.4}{\text{hyp}} \rightarrow \text{hyp} = \frac{6.4}{0.46} = 16$ ~

b) $\tan 69^\circ = \frac{\text{opp}}{\text{Adj}}$

$\tan 69^\circ = \frac{\text{opp}}{\text{Adj}}$ x

$\tan 69^\circ = \frac{\text{opp}}{6.4} \rightarrow \text{opp} = 2.6x$ ~

Angles Shape 1

$$a) \cos x = \frac{A}{H}$$

$$\cos x = \frac{2.5}{6.9}$$

$$\cos x = 0.4 \rightarrow x = \cos^{-1}(0.4) = 66.4$$

$$b) \sin x = \frac{O}{H}$$

$$\sin x = \frac{6.4}{6.9}$$

$$\sin x = 0.93 \rightarrow x = \sin^{-1}(0.93) = 68.4$$

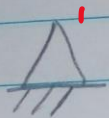
Comment: You can only use this formular (SOHCAHTOA) if you have a right angle triangle. i.e if one of the angle is 90 degree

Section 2

Three most common supports are:

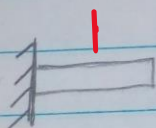


Roller support



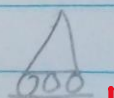
Pinned support

6



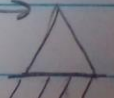
Fixed support

Reaction force of above are:



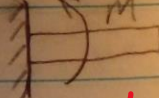
F_v

F_h



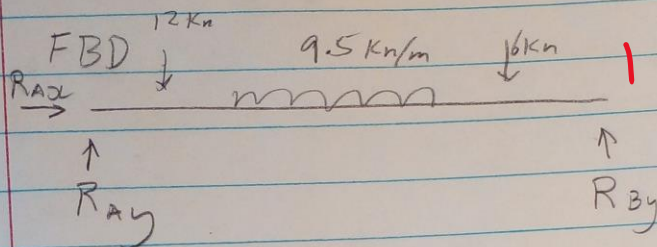
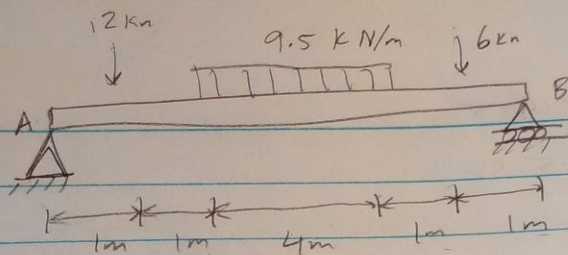
F_v

F_h



F_v

3



$$\sum F_x = 0$$

$$R_{Ax} = 0 \quad \rightarrow \quad \leftarrow$$

$$\sum F_y = 0 \quad \uparrow \downarrow -$$

$$R_{Ay} + R_{By} - 12 - 38 - 6 = 0$$

$$R_{Ay} + R_{By} - 56 = 0$$

$$R_{Ay} + R_{By} = 56$$

$$\sum MD = 0 \quad \rightarrow + \quad \leftarrow -$$

$$(R_{Ay} \times 8) - (12 \times 7) - (36 \times 2) = 0$$

$$8R_{Ay} - 84 - 72 = 0$$

$$8R_{Ay} - 156 = 0$$

$$R_{Ay} = \frac{156}{8} = 19.5 \text{ kN}$$

20.28

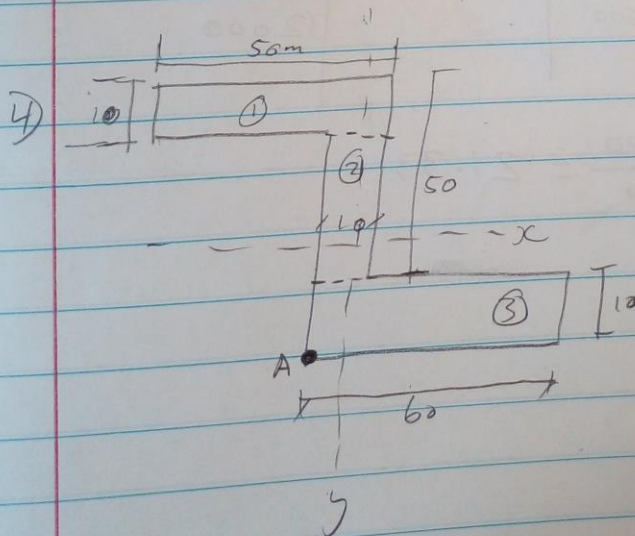
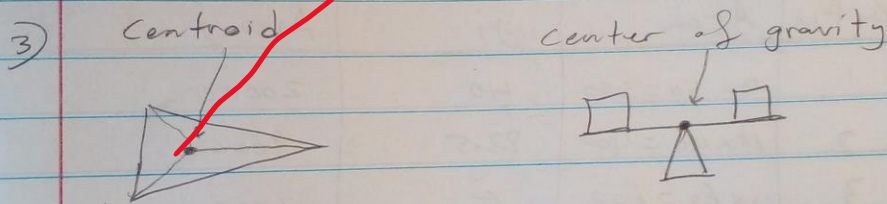
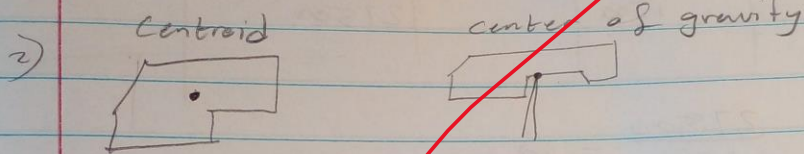
$$R_{By} = 56 - 19.5$$

$$R_{By} = 36.5 \text{ kn}$$

Q. 18

Section 3

- 1) Center of gravity refers to a point where an object mass is focus while a Centroid is the geometrical center of a object.



4)

Part id	area	x_i	Area x
1	$10 \times 50 = 500$	$(50 \div 2) - 10 = 15$	7500
2	$10 \times 40 = 400$	$10 \div 2 = 5$	2000
3	$10 \times 60 = 600$	$60 \div 2 = 30$	18000
	<u>1500</u>		<u>27500</u>

$$\frac{27500}{1500} = 18.33$$

Part id	Area	y_i	Area y
1	$10 \times 50 = 500$	40	20000
2	$10 \times 40 = 400$	22.5	9000
3	$10 \times 60 = 600$	5	3000
	<u>1500</u>		<u>32000</u>

$$\frac{32000}{1500} = 21.33$$

Q4 - 11