

70%

Question 2.

Q2-21

A)

a) Fixed Support



2

b) Pin Support



2

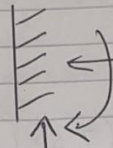
c) Roller Support



2

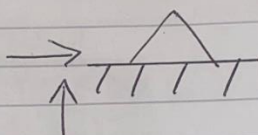
B)

Fixed Support



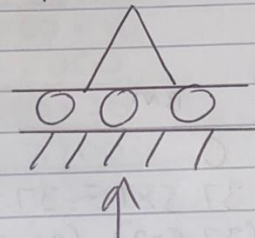
1

Pin Support



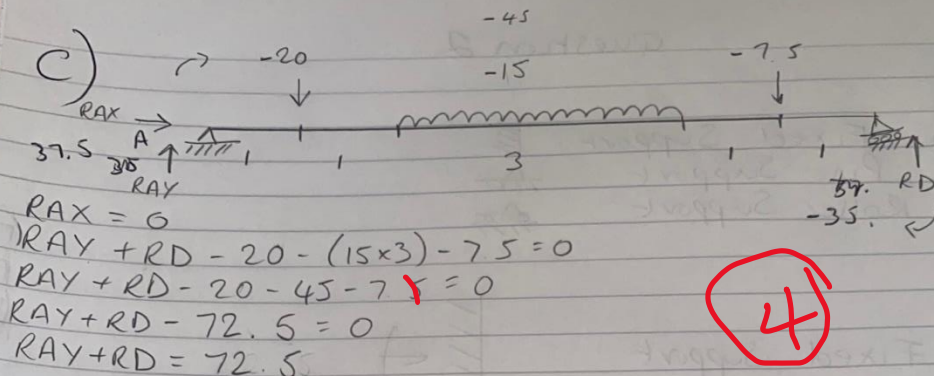
1

Roller Support



1

9



$$R_{AY}(7) - (6 \times 45) - (7.5 \times 1)$$

$$R_{AY}(7) - 270 - 7.5$$

$$R_{AY}(7) = 262.5$$

$$R_{AY} = 262.5 \div 7$$

$$R_{AY} = 37.5$$

$$R_D = 72.5 - 37.5$$

$$72.5 - 37.5$$

$$= 35$$

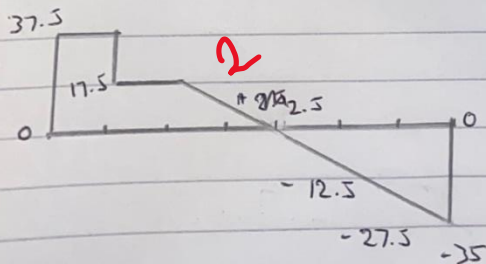
$$R_D = 35 \text{ (Reaction)}$$

$$R_{AY} = 37.5$$

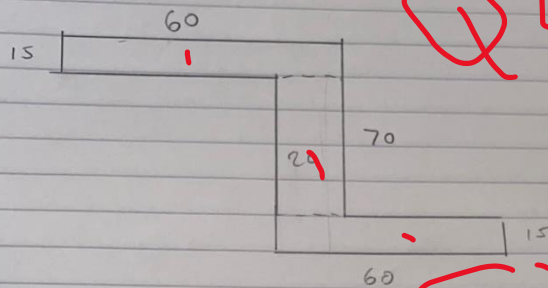
	SFD	BM
0	0 or 37.5	0
1m from A	$37.5 - 20 = 17.5$	$37.5 \times 1 = 37.5$
2m from A	$37.5 - 20 = 17.5$	$(37.5 \times 2) - (20 \times 1) = 55$
3m from A	$37.5 - 20 - 15 = 2.5$	$(37.5 \times 3) - (20 \times 2) - (15 \times 0.5) = 65$
4m from A	$37.5 - 20 - (15 \times 2) = -12.5$	$(37.5 \times 4) - (20 \times 3) - (15 \times 2 \times 1) = 60$
5m from A	$37.5 - 20 - (15 \times 3) = -27.5$	$(37.5 \times 5) - (20 \times 4) - (15 \times 3 \times 1) = 62.5$
6m from A	$37.5 - 20 - (15 \times 3) - 7.5 = -35$	
7m from A	$37.5 - 20 - (15 \times 3) - 7.5$	

$$+35 = 0.$$

SFD



A)



Q4-21

	AREA	x	Total
1	15×60 $= 900$	$60 \div 2$ $= 30$	900×30 $= 27000$
2	20×55 $= 1100$	$20 \div 2$ $= 10$	1100×10 $= 11000$
3	15×60 $= 900$	$60 \div 2$ $= 30$	900×30 $= 27000$
=	2900		= 65000

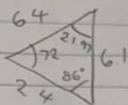
$$\bar{x} = 65000 \div 2900$$

$$\bar{x} = 22.41 \text{ mm}$$

$$\bar{y} = 50 \text{ as } y \text{ is symmetrical}$$

	I_{xx}	AREA	$\bar{y}$	$A \times \bar{y}$
1	$60 \times 15^3 / 12$ $= 16875$	900	$50 - (15 \div 2)$ $= 42.5$	900×42.5^2 $= 382500$
2	$70^3 \times 20 / 12$ $= 571666$	1100	0	0
3	$60 \times 15^3 / 12$ $= 16875$	900	$50 - (15 \div 2)$ $= 42.5$	900×42.5^2 $= 382500$
=	605416.6			765000

$$= 3251250 \div 605416.6 = 5.37 \text{ mm}$$



Q1 - 28

$$A^2 = b^2 + c^2 - 2bc \cos(A)$$

$$A^2 = 6.4^2 + 2.4^2 - (2 \times 6.4 \times 2.4 \cos 72)$$

$$A^2 = 6.101$$

$$A = 6.1m$$

4

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

$$\frac{6.101}{\sin(72)} = \frac{2.4}{\sin(B)} \quad \sin(B) = \frac{2.4}{6.101} = \frac{6.101}{\sin(72)}$$

$$= 0.3741$$

$$\sin^{-1}(0.3741) = 21.97^\circ$$

4

$$C = 180 - 21.97 - 72 = 86^\circ$$

5

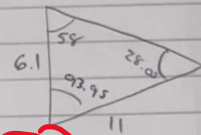
$$\frac{b}{\sin(B)} = \frac{d}{\sin(D)}$$

$$\sin(D) = d \div \frac{b}{\sin(B)}$$

$$\sin(D) = 6.1 \div \frac{11}{\sin(58)}$$

$$\sin(D) = 0.478$$

$$D = 28.05$$



5

$$a^2 = b^2 + c^2 - 2bc \cos(A)$$

$$b^2 = c^2 + d^2 - 2dc \cos(B)$$

$$11^2 = c^2 + 6.1^2 - 2 \times c \times 6.1 \cos(58)$$

$$11^2 = c^2 + 37.21$$

5

$$180 - 28.05 - 58 = 93.95$$

$$\frac{c}{\sin(C)} = \frac{b}{\sin(B)} \quad c = \frac{b}{\sin(B)} \times \sin(C)$$

5

$$c = \frac{11}{\sin 58} \times \sin(93.95) \quad c = 12.9m$$