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ID :- 7274.

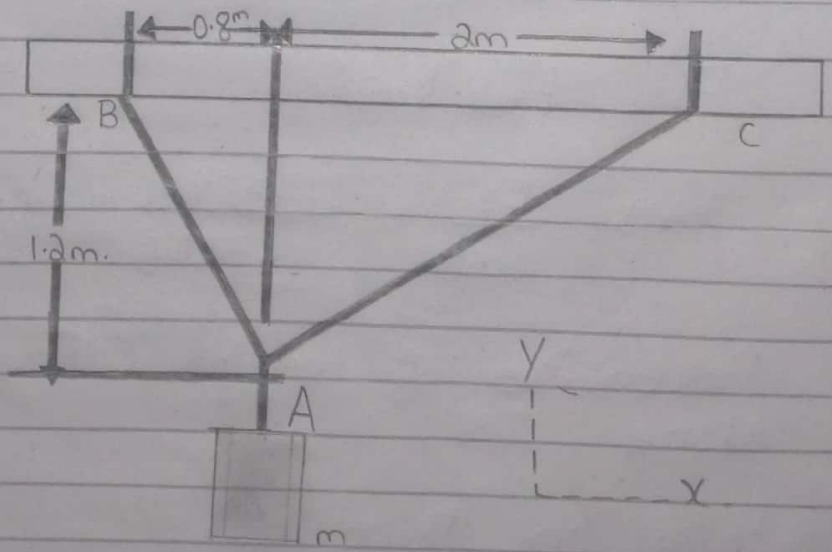
Subject:- Engineering Mechanics.

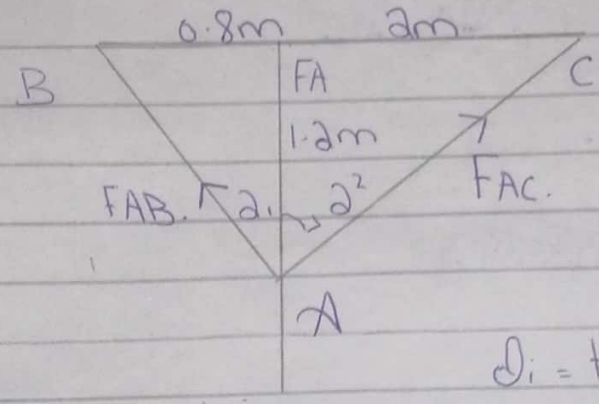
BATCH :- 2013.

Instructor :- MAJID NAEEM.

Note:- Attempt all questions.

Q1. Part (a):- Two high strength flexible steel cables AB & AC are fastened to the ceiling of a building..... of the system?





$$\theta_1 = \tan^{-1}\left(\frac{0.8}{1.2}\right)$$

$$\theta_1 = 33.6$$

$$\theta_2 = \tan^{-1}\left(\frac{2}{1.2}\right)$$

$$\theta_2 = 59.0$$

Resolve the Coponent.

$$F_A = F_{AC} \cos\theta_2$$

$$F_{AC} = \frac{F_A}{\cos\theta_2} = \frac{1773.8m}{\cos(59.0)} = 3444.0m$$

$$F_A = F_{AB} \cos\theta_1$$

$$F_{AB} = \frac{F_A}{\cos\theta_1} = \frac{1773.8M}{\cos 33.6} = 2129.6$$

Percentage of weight Caoned by As alone is.

Force in Point A.

$$F_A = mg.$$

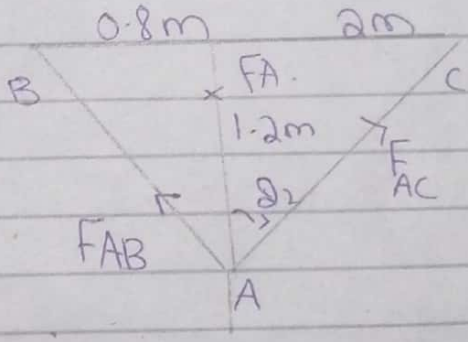
$$F_A = (400 \text{ Point})(9.8) = 3920$$

Percentage of weight

$$F_{AB} = \frac{2129}{3920} \times 100$$

$$= 54.3\%$$

Part (b):- If the water tank weight & Volume of water are increased 5% & respectively what effects will occur on results of Part-a(3).



$$\theta = \tan^{-1}\left(\frac{0.8}{1.2}\right)$$

$$\theta_1 = 33.6$$

$$\theta_2 = \tan^{-1}\left(\frac{2m}{1.2}\right)$$

$$\theta_2 = 59^\circ$$

Resolve the caporant

$$F_A = F_{AC} \cos\theta_2$$

$$F_{AC} = \frac{F_A}{\cos\theta_2} = \frac{773.8M}{\cos(59.0)} = 3444.0M$$

$$F_A = F_{AB}\text{used}$$

$$FAB = \frac{FA}{\cos\theta} = \frac{1773.8N}{\cos 33.6} = 2129.6.$$

Percentage of weight carried by AS alone is.

Force in Point A.

Percantage A weight by alone is.

Force is Point A.

$V_1 FA = Mg.$

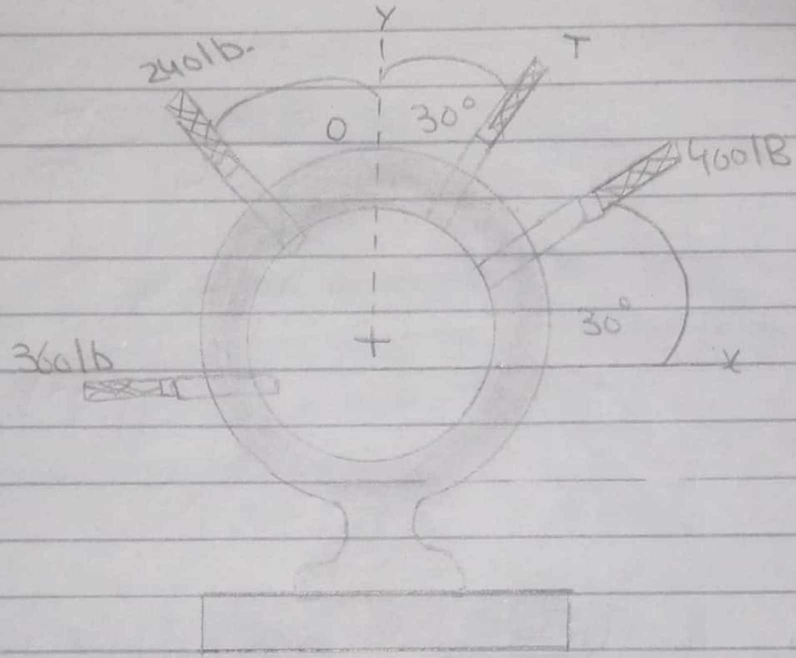
$FA = (34.0 \text{ Pond})(9.8) = 3,332.$

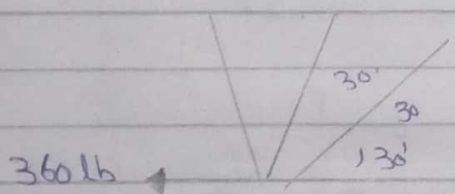
• Percatage of weight.

$$FAB = \frac{2129}{3332} \times 100$$

$= 63.8\%$

Q2:- Four Forces are exerted on the eyebolt as shown below................ Values of T & θ.





400lb $-600\,lb = \frac{400 \overset{200}{\sin 30}}{T\,30° + 240 \cos\theta}$

0.866

$-600\,lb = 200 + 0.86\,T + 240 \cos\theta$

$400\,lb = 0.8166\,T + 240 \cos\theta$ (I) $\therefore 360\,lb = 240 \sin\theta - T \sin 30 - \overset{200}{400 \sin 30}$

$560 = 240 \sin\theta - 0.5\,T$ (II)

(I). $\frac{400\,lb}{0.866} = \frac{0.866\,T}{0.8666} + \frac{240 \cos\theta}{0.866}$

$462 = T + 277.14 \cos\theta \rightarrow$ (III)

(II) $\frac{560}{0.5} = \frac{240 \sin\theta}{0.5} - \frac{0.5\,T}{0.5}$

$1120 = 480 \sin\theta - T \rightarrow (iii)$

Divide (iii) by (iii).

$$\frac{1120}{4621b} = \frac{480 \sin\theta}{277.14\cos\theta} - \frac{T}{T}$$

$$2.42 = 1.73 \tan\theta$$

$$\theta = \tan^{+}(2.42/1.73).$$

$$\theta = 54.43^{\circ}$$

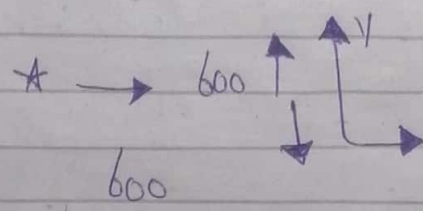
$$-600 Pb = 200 + 0.866\,T + 240\cos(54.43)$$

$$-4001b - 139.6 = 0.866T.$$

$$-539.6 = 0.866T.$$

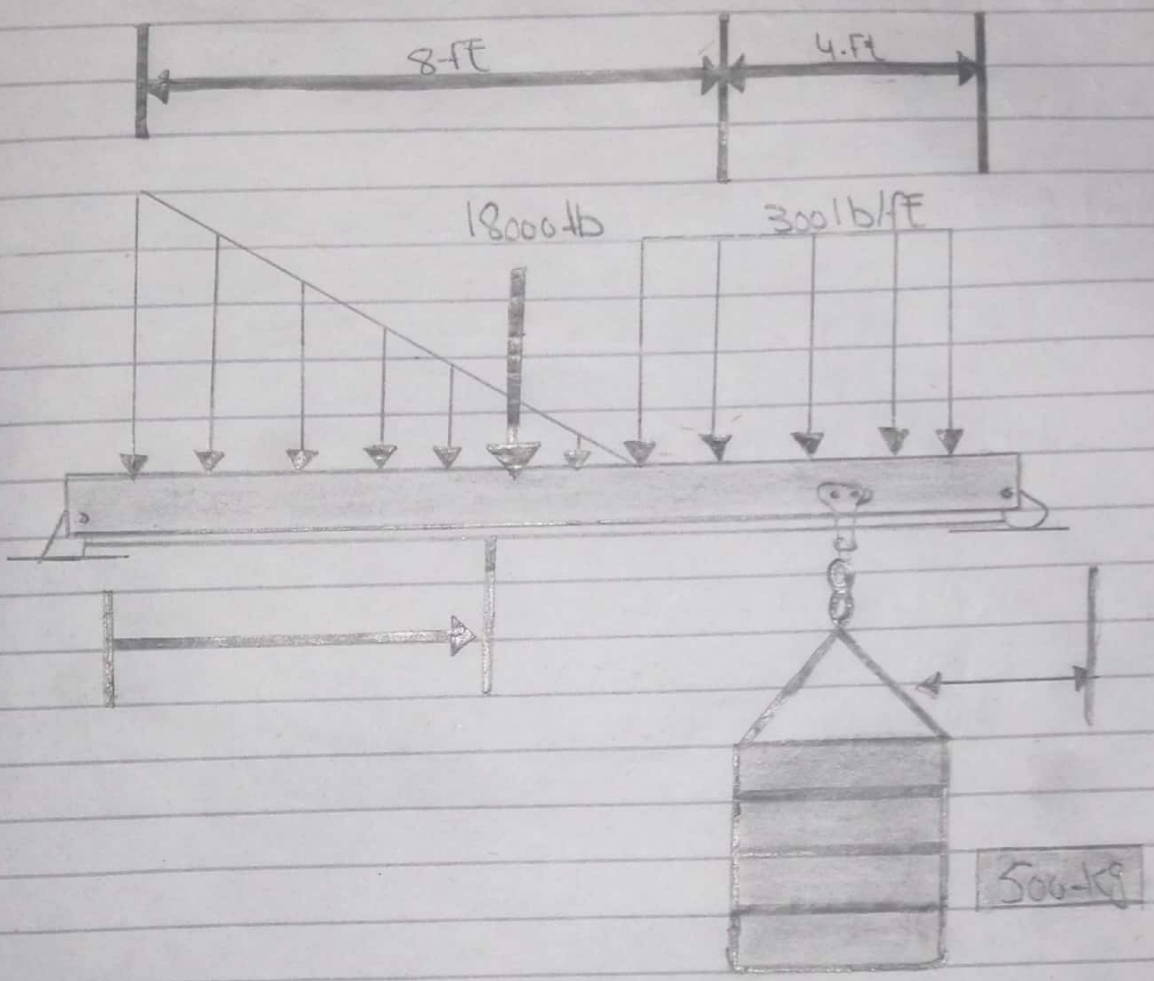
$$-623.09 = T.$$

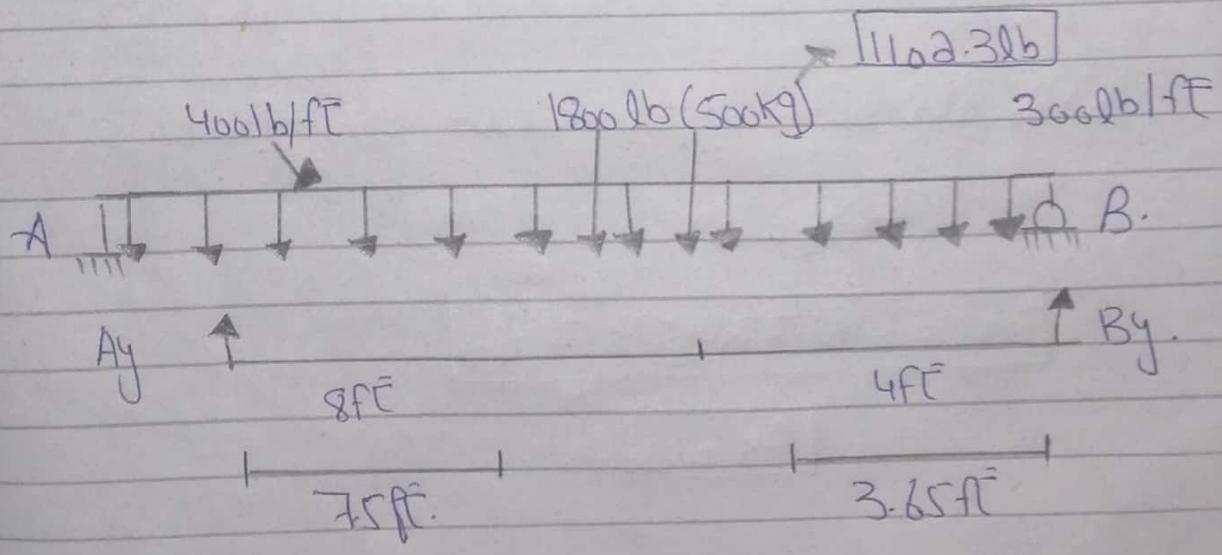
lb.



May be given direction of 9600 lb" is taken in opposite direction.

Q3:- Calculate the reactions at supports.





Taking summition moment at 'B' equal to zero.

$\Sigma M_B = 0$.

$(Ay \times 12) - (18000 \times 4.5) - (400 \times 8)\frac{8}{2} + 4)$

$- (1102.3 \times 3.65) - (200 \times 4) = 0$

$12Ay - 81,000 - (3200)(200+4) - 4023.40$

$-1200 = 0$

$= 12Ay = 81,00 - 65\,21800 = 4023.40$

$-1200 = 0.$

$= 12Ay - 6608023.4 = 0$

$12Ay = 6608023.4.$

$Ay = \frac{6608023.4.}{12.}$

$\boxed{Ay = 550\,668.617\ lb.}$

$Ay + By - 3200 - 1200 - 1800 - 1102.3 = 0$

$550,668.617 - 3200 - 1200 - 1800 - 1023.3.$

$+By = 0$

$\boxed{By = -517245.317\ lb}$

$\boxed{Ax = 0}\ lb.$