

# FINAL TERM

Name: Syed Najeeb

ID: 7855

Section: "B"

Semester: 6<sup>th</sup>

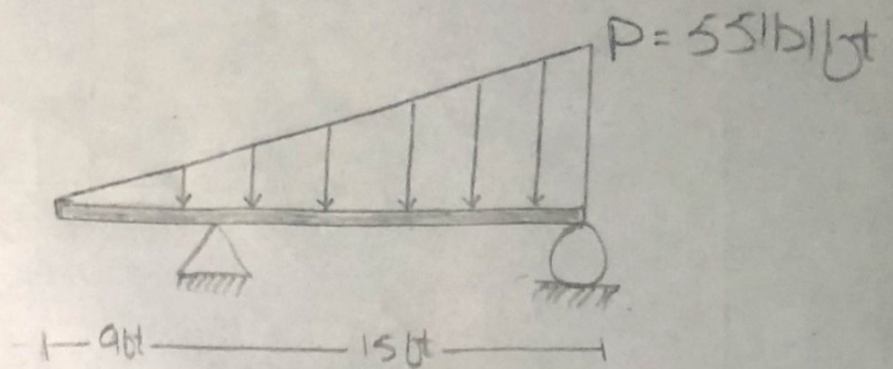
Subject: Structure Analysis - I

Instructor: Engr. Muhammad Saqib

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Question #01

Q#01Solution:

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

$$R_A + R_B - \frac{1}{2} (55) (24) = 0$$

$$R_A + R_B = 660 \rightarrow \textcircled{1}$$

$$\sum M_A = 0 \uparrow + \downarrow -$$

$$-(R_B \times 15) + \left( \frac{1}{2} (55) (15) \right) \left( \frac{2}{3} \times 15 \right) = 0$$

$$-15R_B + 6600 = 0$$

$$R_B = \frac{6600}{15}$$

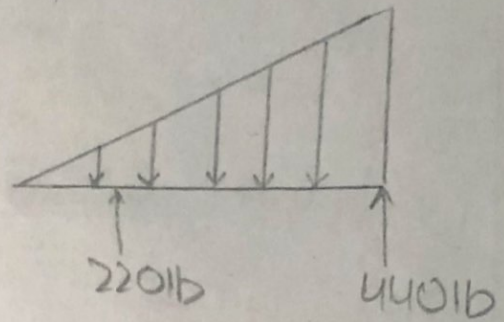
$$R_B = 440 \text{ lb}$$

Put in equation 1 we get

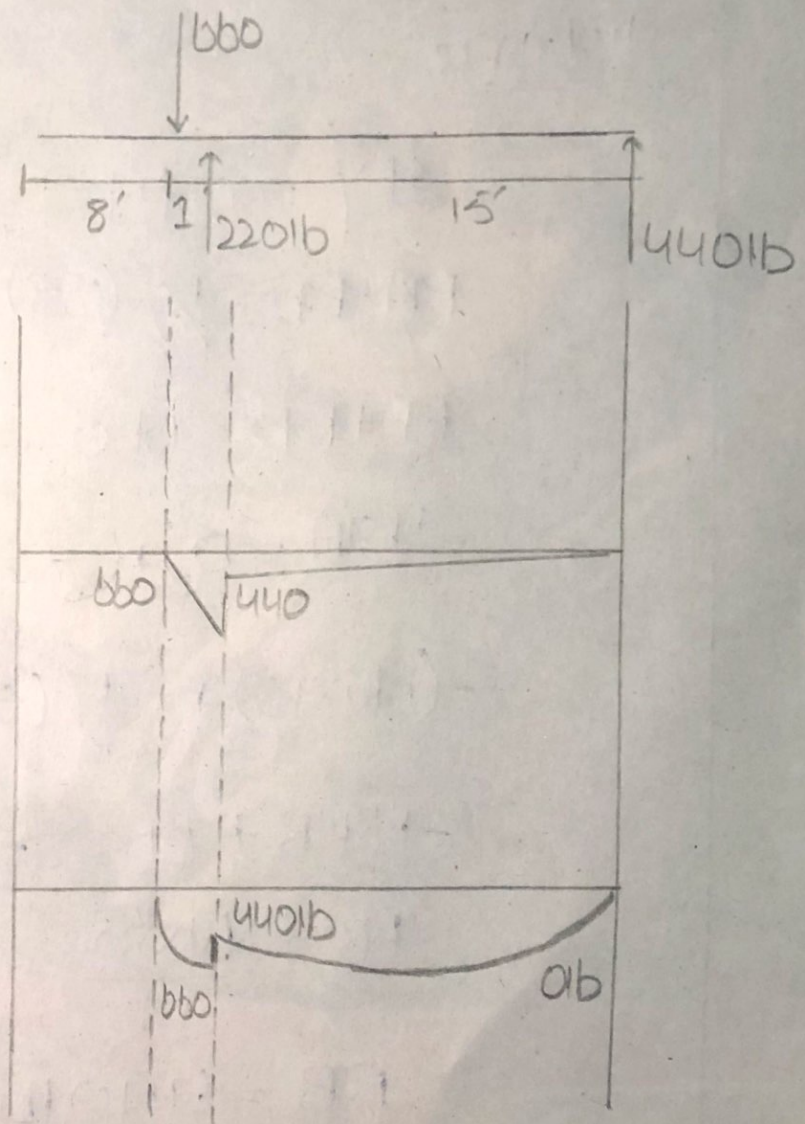
$$R_A = 220 \text{ lb}$$

02

F.B.D



S.F.D



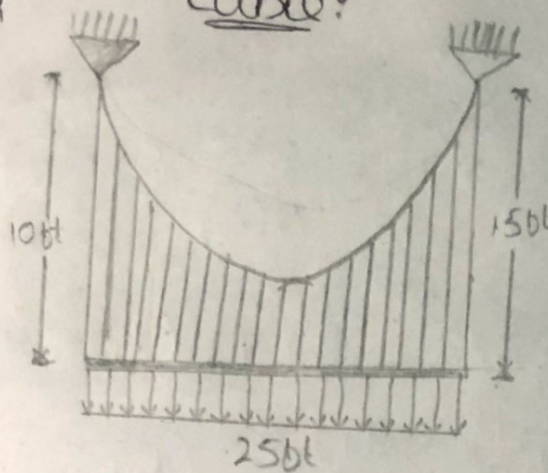
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QUESTION # 02

Q#02

ANS: 02

Cable:

- cable supports uniformly load = 855 lb/ft
- Determine the tension in the cable at:
- Support A = ?
- Support B = ?

Solution:

$$y = \frac{w_0}{2FH} x^2$$

By putting values

$$15 = \frac{855}{2FH} x^2 \quad \text{--- (i)}$$

$$10 = \frac{855}{2FH} (25 \cdot x)^2 \quad \text{--- (ii)}$$

By solving equations

$$FH = \frac{855}{2(15)} x^2, \quad FH = \frac{855}{2(10)} (25 \cdot x)^2$$

04

now

$$FH = FH$$

$$\frac{855}{2(15)} x^2 = \frac{855}{2(10)} (25-x)^2$$

$$28.5x^2 = 42.75(625 - 50x + x^2)$$

$$x^2 = \frac{42.75}{28.5} (625 - 50x + x^2)$$

$$x^2 = 1.5(625 - 50x + x^2)$$

$$0.5x^2 - 75x + 937.50 = 0 \quad \text{--- (1)}$$

now choose root  $< 25$  ft

By solving eq (1)

$$x = 13.76 \text{ ft}$$

now,

$$25 - 13.76 = 11.25 \text{ ft}$$

As

$$FH = \frac{855}{2(15)} x^2 = \frac{855}{2(15)} (13.76)^2 = 5503.16 \text{ lb} \quad \text{--- (A)}$$

$$FH = \frac{855}{2(10)} (25-x)^2 = \frac{855}{20} (11.25)^2 = 5410.54 \text{ lb} \quad \text{--- (B)}$$

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Support B

$$y = \frac{w_0}{2FH} x^2 = \frac{855}{2(5410.54)} (x^2)$$

$$\frac{dy}{dx} = \tan \theta_B = 0.0792 (x^2) = 0.0792 (13.76)$$

$$= 1.089$$

we have

$$\tan \theta_B = 1.089$$

$$\theta_B = \tan^{-1}(1.089)$$

$$\theta_B = 47.439^\circ$$

Tension at B;

$$T_B = \frac{FH}{\cos \theta_B} = \frac{5410.54}{\cos(47.439)} = 8038.10 \text{ lb}$$

$$= 8.038.10 \text{ kip}$$

ob

SUPPORT : A

$$y = \frac{w_0}{2FH} x^2 = \frac{855}{2(5503.12)} (25-x)^2$$

$$= \frac{855}{2(5503.12)} (11.25)^2 \quad \boxed{y = 9.831}$$

$$\frac{dy}{dx} = \tan \theta = 9.831$$

$$\theta = \tan^{-1}(9.831)$$

$$\theta = 84.191^\circ$$

Now

$$T_A = \frac{FH}{\cos \theta} = \frac{5503.12}{\cos(84.191)}$$

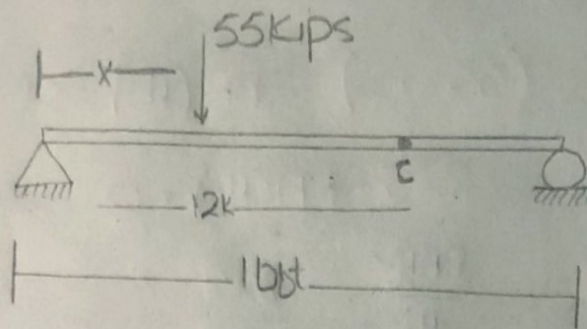
$$= 55541.16$$

$$\boxed{T_A = 55.541 \text{ kips}}$$

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Question # 03

Q#03

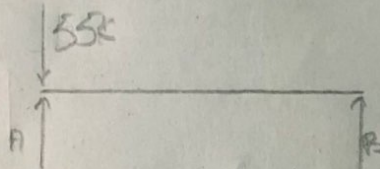
$$P = 55$$

Solution:

FOY

$$x = 0$$

$$R_A = ?$$



$$\sum M_B = 0$$

$$(55 \times 10) - R_A(10) = 0$$

$$880 - R_A(10) = 0$$

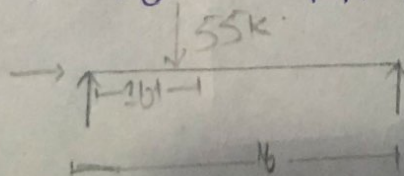
$$\frac{R_A 10}{10} = \frac{880}{10}$$

$$R_A = 55$$

FOY

$$x = 10 \text{ ft}$$

$$R_A = ?$$





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$$\sum M_B = 0$$

$$(55 \times 15) - RA(16) = 0$$

$$825 - RA(16) = 0$$

$$\frac{RA \cdot 16}{16} = \frac{825}{16}$$

$$RA = 51.56$$

For  $x = 5$        $RA = ?$

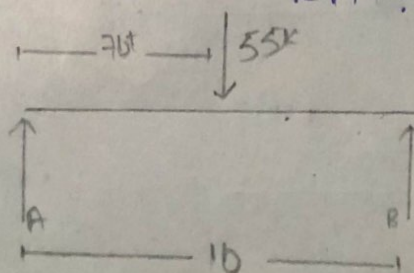
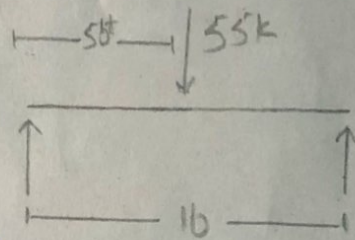
$$\sum M_B = 0$$

$$(55 \times 5) - RA(16) = 0$$

$$275 - RA(16) = 0$$

$$\frac{RA \cdot 16}{16} = \frac{275}{16}$$

$$RA = 17.18$$



09

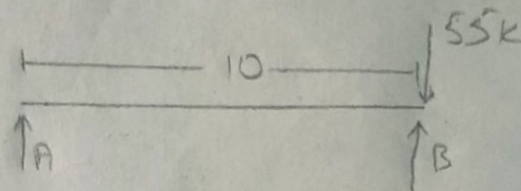
$$\sum M_B = 0$$

$$(55 \times 7) - R_A(16) = 0$$

$$385 - R_A(16) = 0$$

$$\frac{R_A(16)}{16} = \frac{385}{16}$$

$$R_A = 24.06$$



$$-R_A(16) + 55(10) = 0$$

$$R_A = 0$$

$$R_{A1} = 55$$

$$R_{A2} = 51.56$$

$$R_{A3} = 17.18$$

$$R_{A4} = 24.06$$

$$R_{A5} = 0$$

