Name # Zohaib Ahmad

ID # 7797

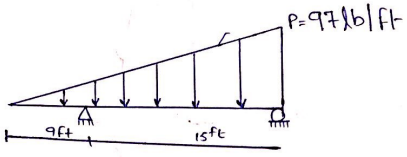
Section # A

Subject # Structural Analysis - 1

Instructor # Engr. Muhammad Saqib

Exam # Final Term

Q No: 1



Solution:-

Total load = 1/2 (l) (b)

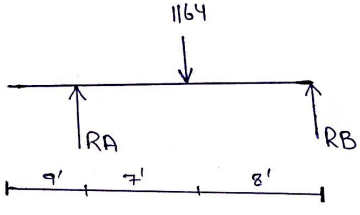
= 1/2 (24) (97)

Total = 1164

load location = 2/3 (l)

= 2/3 (24)

= 16



Now Finding Reactions

$\Sigma f_y = 0$ $R_A + R_B - 1164 = 0$

$R_A + R_B = 1164$

$\Sigma M_A = 0$ ↻+

$-R_B \times 15 + 1164 \times 7 = 0$

$15 R_B = 8148$

$R_B = 543.2$

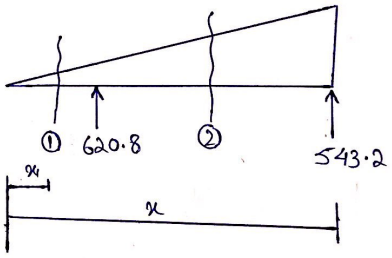
$R_A + R_B = 1164$

$R_A = 1164 - R_B$

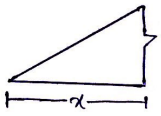
$R_A = 1164 - 543.2$

$R_A = 620.8$

Finding shear of equation



Section = 1~1

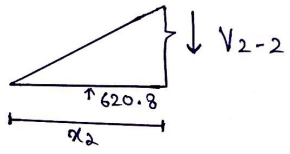


$V_{1-1} = 1/2 \times x_1 \times 97/24 x_1 = 97/48 x_1^2$

$V_{1-1} = \underset{x=0}{1} = \frac{97}{48} \times (0)^2 = 0$

$V_{1-1} = \underset{x=9}{1} = \frac{97}{48} (9)^2 = 163.81 \text{ lb}$

Section = 2~2



$\Sigma f_y = 0 \uparrow +$

$-V_{2-2} + 620.8 - 1/2 \times 97/48 x^2 \times x^2 = 0$

$V_{2-2} = 620.8 - 97/48 x_2^2$

$V_{2-2}|_{x=9} = 620.8 - 97/48 (9)^2$

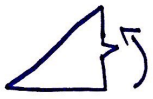
$= 457.11 \text{ lb}$

$V_{2-2}|_{x=24} = 620.8 - 97/48 (24)^2$

$= -543.2$

For bending moment for Section 1-1

$M = -1/2 \times x_1 \frac{97}{24} \times 1/3 x_1$



$M = -97/144 x^3$ $\quad x_1 = 0-9$

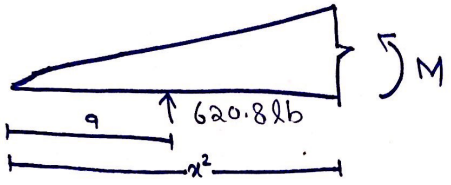
at $x = 0$

$M = -97/144\ (0)^3 = 0$

at $x = 9$

$\Rightarrow M = -97/144\ (9)^3 = -491.026 lb.ft$

For Section 2-2



$M = 620.8 \times (x_2 - 9) - 1/2 \times 97/24\ x_2 \times x_2 \times 1/3 \times x_2$

$M = 620.8(x_2 - 9) - 97/144\ x_2^3$

at $x_2 = 9'$ $(x_2 = 9 - 24)$

$M = 620.8\ (9-9) - 97/144\ (9)^3 = 0 - 491.062$

$M = -491.062$

at $x_2 = 24'$

$M = 620.8\ (24-9) - 97/144\ (24)^3$

$M = 9312 - 9312$

$M = 0 lb-ft$

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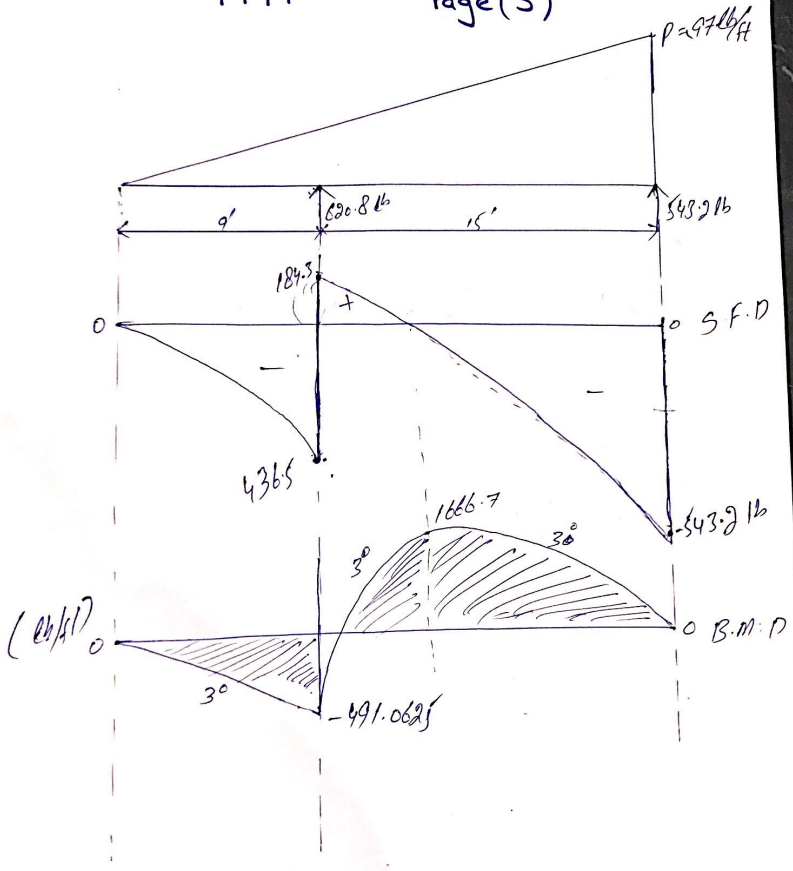
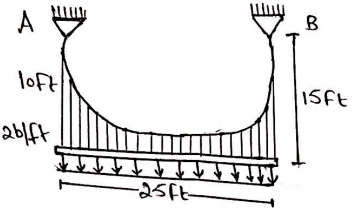


Q No 2



Given Data:-

Uniformly load $w_o = 797$ lb/ft

$T = ?$

Formula:-

$$y = \frac{w_o}{2F_H} x^2$$

Putting values

$$15 = \frac{797}{2F_H} x^2$$

$$10 = \frac{797}{2F_H} (25-x)^2$$

$$\frac{797\, x^3}{2(15)} = \frac{797}{2(10)} (25-x)^2$$

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

$$x^2 = 937.5 - 75x + 1.5x^2$$

$$x^2 - 1.5x^2 + 7.5 + 937.5 = 0$$

$$-0.5x^2 + 75x - 937.5 = 0$$

$$0 = 0.5x^2 - 75x + 937.5$$

By quadratic equation

$x_1 = 136.23$ ft

$x_2 = 13.76$ ft

By quadratic eqn given value is

$x_2 = 13.76 \text{ ft}$

$F_H = \frac{w_o x^2}{2y} \Rightarrow F_H = \frac{797}{2 \times 15} (13.76)^2$

$F_H = 5030.068$

At B:-

$y = \frac{w_o}{2F_H} x^2 \Rightarrow \frac{797}{2 \times 5030.068}$

$\frac{dy}{dx} = \tan \theta_B \Rightarrow 0.158x \Big|_{x=13.76}$

$\frac{dy}{dx} = \tan \theta_B = 2.17$

Now to find the angle

$\tan \theta_B = \tan^{-1} 2.17 \Rightarrow \theta_B$

$\theta_B = \tan^{-1} 2.17$

$\theta_B = 65.25^\circ$

At point A: B

$y = \frac{w_o}{2F_H} x^2 \Rightarrow \frac{797 \times x^2}{2 \times 8.5030.68}$

$dy/dx = \tan \theta_H = 0.158 \Big|_x (25 - 13.76)$

$\tan \theta_A \Rightarrow 1.77$

$\theta_A = \tan^{-1} = 1.77$

$\theta_A = 60.53^\circ$

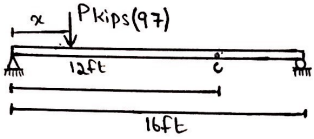
$T_A = F_H / \cos \theta_A \quad 797/\cos(60.53)$

$\boxed{T_A = 1620.0248 \text{ lb.Ft}}$

Q No:-3

Solution:-

→ Influence Line

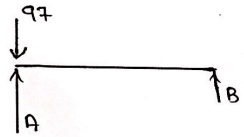


Reg No = 7797

Now Put 97 ↗

Now we know that

For $x = 0$ $R_A = ?$ ID = 7797



$$\Sigma M_B = 0 \quad (\curvearrowleft + \ \curvearrowright -)$$

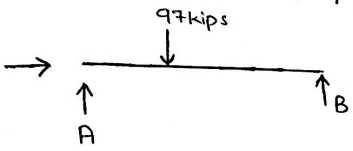
$$(97 \times 16) - R_A (16) = 0$$

$$1552 = R_A (16)$$

$$R_A = \frac{1552}{16}$$

$$R_A = 97 \text{ kip}$$

For $x = 1ft$ $R_A = ?$



$\Sigma M_B = (\curvearrowright +)$

$(97 \times 15) - R_A (16) = 0$

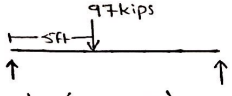
$1455 = R_A (16$

$R_A = \frac{1455}{16}$

$R_A = 90.9375 \text{ kips}$

For

$x = 5$ $\quad R_A = ?$



$(97 \times 5) - (R_A \times 16) = 0$

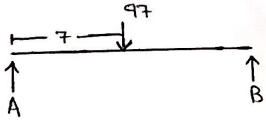
$485 = R_A \times 16$

$R_A = \frac{485}{16}$

$R_A = 30.31 \text{ kips}$

Now Put.

$x = 7$ $\quad R_A = ?$

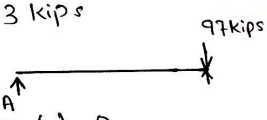


$\Sigma M_A = (\curvearrowright +)$

$(97 \times 7) - R_A \times 16 = 0$

$\frac{679}{16} = R_A$

$R_A = 42.43 \text{ kips}$



$-R_A (16) + 97 (0) = 0$

$R_A = 0$