Finial term

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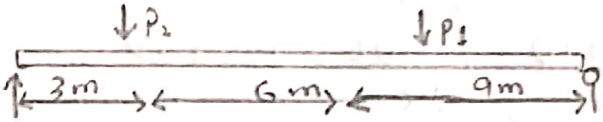
Section : A

Department : Civil Engineering.

Q1:- Find the support reaction,

$P_1 = 200 + 1D$ no.) ,($P_2 = 500 + 1D$ no)



Sol:-

$P_1 = 200 + 1.0$

$= 200 + 16094$

$P_1 = 16,294$

$P_2 = 500 + 1D$

$P_2 = 500 + 16094$

$P_2 = 16,594$

$R_{1x} = 0$ $\quad \Sigma F_x = 0$

Now

$R_{1y} + R_{2y} - P_1 - P_2 = 0$

$R_{1y} + R_{2y} - 16294 - 16594$

$R_{1y} + R_{1y} - 32,888$ eq(1) $\quad \boxed{R_{1y} + R_{2y} = 32,888}$ eq

$R_{1y} = [(16594 \times 9) + (16294 \times 15)] / 18$

$R_{1y} = (149,346 + 244,410) / 18$

$= 393,756 / 18$

$\boxed{R_{1y} = 21,875.33}$ put in eq (1)

$R_1y + R_2y = 21875 +$

$R_2y = -R_1y + 32888$

$R_2y = 32,888 - 21875.33$

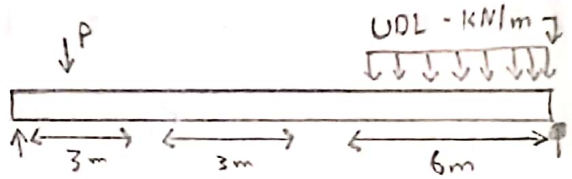
$\boxed{R_2y = 11,012.67}$

$\boxed{R_1x = 0}$, $\boxed{R_1y = 21875.3}$ $R_2y = \boxed{11,012.67}$

X ——— X ——— X

Q no02: Draw the neat shear diagram, show all your calculations.

P = 100 + 1D ; UDL = 150 + 1D



$P_1 = 100 + 1.D$

$P_1 = 100 + 16094 = 16194$

$UDL = 150 + 1D$

$= 150 + 16094 = 16,244$

UDL resultant = 16244 KN/m * 6m

= 97,464 KN

$R_1x = 0$ $\quad \xi F_x = 0$

$R_1y + R_2y - P_1 - P_2 = 0$

$R_1y + R_2y - 16194 - 97464 = 0$

$R_1y + R_2y = 113,658$

$$R_1y = \frac{(97464 \times 3) + (16194 \times 9)}{12}$$

$$R_1y = \frac{292,392 + 145,746}{12}$$

$$\boxed{R_1y = 36,511.5 \text{ KN}}$$

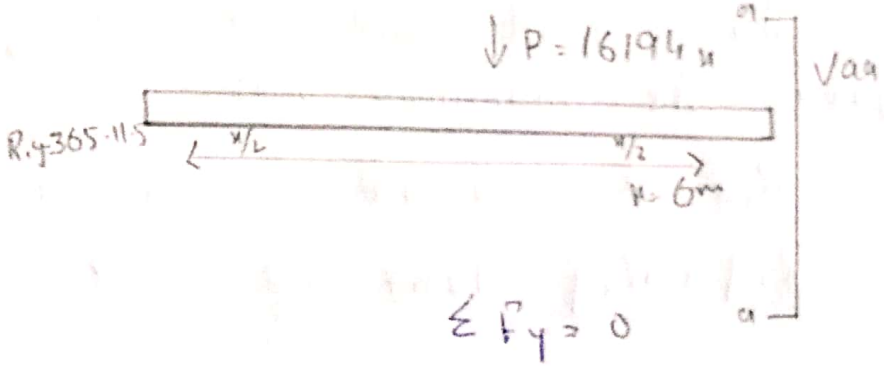
$$R_2y = 113,658 - R_1y$$

$$R_2y = 113,658 - 36511.5$$

$$R_2y = 77146.5$$

$$\boxed{R_1x = 0} \qquad \boxed{R_1y = 36511.5 \text{ KN}}$$

$$\boxed{R_2y = 77146.5}$$



$$\Sigma F_y = 0$$

$$-V_{aa} - P + 36511.5 = 0$$

$$V_{aa} = 36511.5 - 16194$$

To find the location of shear force put eqn equal to zero.

$$0 = 36511.5 - 16194x$$

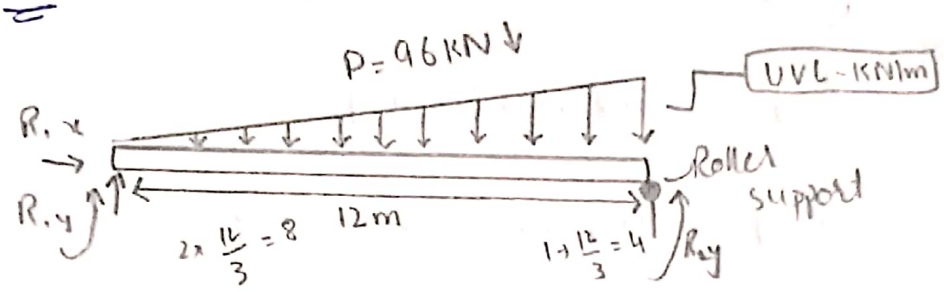
$$x = \frac{36511.5}{16194} \quad = \quad x = 2.25 \text{ m}$$

at $x = 2.25$m the shear force will be zero.

Question no. 03:

Draw the neat shear force and bending moment diagrams, show all your calculations.
(UVL = ID/1000)

Sol:



$$UVL = ID/_{1000} = \frac{16094}{1000} = 16.094$$

$$UVL\ resultant = \frac{16\ KN/m \times 12m}{2}$$

$$UVL = 96KN$$

This load will set at $\frac{1}{3}$ of length from the maximum side

$R_{1x} = 0 \rightarrow eq①$ $\quad \Sigma F_x = 0$

$R_{1y} + R_{2y} - 96KN = 0 \rightarrow eq(ii)$

$(R_{2y} \times 12) - (96 \times 8) = 0 \rightarrow eq(iii)$

$(12 \times R_{2y}) = (96 \times 8)$

$R_{2y} = \frac{(96 \times 8)}{12} = \boxed{64\ KN = R_{2y}}$

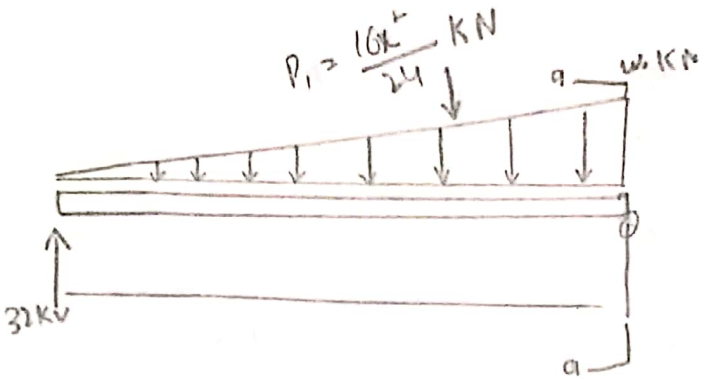
$R_{1y} + R_{2y} = 96KN$

$R_{1y} = 96 - R_{2y}$ (putting value of R_{2y})

$R_{1y} = 96 - 64$

$\boxed{R_{1y} = 32\ KN}$

$R_{1x} = 0$, $R_{1y} = 32\,kN$, $R_{2y} = 96\,kN$



From Similar triangle law

$$\frac{16\,kN/m}{12m} = \frac{w\,kN/m}{x-m}$$

$$w = \left(\frac{16x}{12}\right) kN/m$$

$$\Sigma F_y = 0$$

$$-V_{aa} - P_1 + 32\,kN$$

$$-V_{aa} - \frac{16x^2}{24} + 32 = 0$$

$$V_{aa} = 32 - \frac{16x^2}{24} \quad \text{— eq (1)}$$

At $x = 0$ eq (1) $= 32$

At $x = 12$ eq (1) $= 96$

the point at which shear force negative

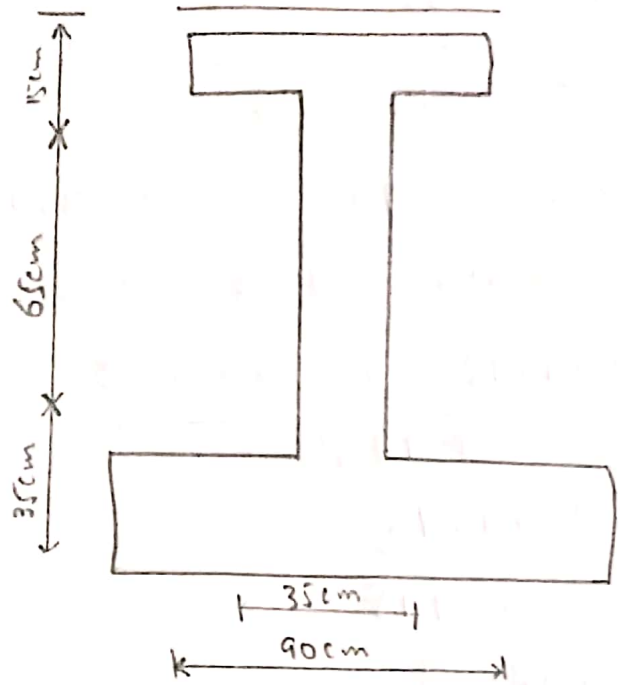
$$0 = \frac{16x^2}{24} + 32 \qquad = \qquad \frac{16x^2}{24} = 32$$

$x = 48$ $\qquad$ $x = 6.92$

∴ Hence the shear force is positive

Question no 04: (6)

Find the centroid of give shape.



Fist we have to establised the coordinate system. Divide the composite area into different simple area.

$A_1 = (0.9 \times 0.35) = 0315$

$A_2 = (0.8 \times 0.35) = 0.28$

$A_3 = (0.9 \times 0.2) = 0.18$

Find the certain piont of each area from the origin:

$Y_1 = 0.9/2 = 0.45$

$Y_2 = 0.9/2 = 0.45$

$Y_3 = 0.9/2 = 0.45$

$Z_1 = 035/2 = 0.175$

$Z_2 = 0.35 + \left(\frac{0.65}{2}\right) = 0.675$

$$Z_3 = 0.35 + 0.65 + (0.15/8) = 1.075$$

$$y_c = \frac{A_1 y_1 + A_2 y_2 + A_3 y_3}{A_1 + A_2 + A_3}$$

$$y_c = \frac{(0.315 \times 0.45) + (0.28 \times 0.45) + (0.18 \times 0.45)}{0.315 + 0.28 + 0.18}$$

$$y_c = \frac{0.14175 + 0.126 + 0.08}{0.775}$$

$$y_c = \frac{0.34875}{0.775}$$

$$\boxed{y_c = 0.45m}.$$

$$Z_c = \frac{A_1 Z_1 + A_2 Z_2 + A_3 Z_3}{A_1 + A_2 + A_3}$$

$$Z_c = \frac{(0.315 \times 0.175) + (0.28 \times 0.675) + (0.18 \times 1.775)}{0.315 + 0.28 + 0.18}$$

$$Z_c = \frac{0.055125 + 0.189 + 0.1935}{0.775}$$

$$\boxed{Z_c = 0.56m}$$

Qno 5: Explain work, energy and power with examples.

Ans:

Work:

The application of a force through certain distance is known as work. Of measure in joules (J)

OR:

work is product of force and displacement. work = force x distance in direction of force ($w = F \cdot d$)

The work is calculated by multiplying the force by the amount of movement of an object ($w = f \times d$). A force of 10 newtons, that moves an object 3 meters, does 30 n-m of work. A newton-meter is the same thing as a joule. So unit of work is same as unit of Energy.

Examples:-

There are several good examples of work that can be observed in every day life- a horse pulling a plow through the field, a father pushing a grocery cart down the aisle of grocery store, a freshman lifting a back pack full of books upon her shoulders, a weightlifter lifting a barbell above his head.

② Power:

Power is the rate at which work is done, or the rate at which energy is transferred.

Power = done work / taken time.

$$P = W/t$$

where

- Power is measured in watts (w)
- work done or energy transffered is measure in joules (J)
- time is measured in seconds (s).

Examples:-

There are many practical examples of power such as,

A car engine is an example of a machine that is given a power rating. The power rating relates to how rapidly the car can accelarate. other example of power are windmill, turbine, and aeroplane engine is als an example of power.

③ Energy:

is the measure of the ability of an object or a system to perform work. Its unit is joule and denoted by J.

There are many types of energy:
- kinetic Energy
- potiential
- elastic
- chemic
- nuclear Energy.

1 joule (J) is the MKS unit of energy equal to the force of one Newton acting through one meter.

1 joule (J) = 1N·m

Energy is the measure of the ability of an object or a system to perform work.

Examples:

Examples of energy are: watching T.V, washing clothes, heating, lighting the home, running appliances and cooking etc.

x —— x —— x