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Section . B .

Dept . BE (civil) .

Mechanics F-Assignment .

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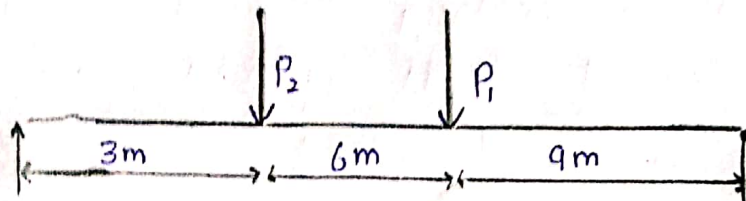
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QUESTION #. 1

Find the Support reaction. Show All calculation?

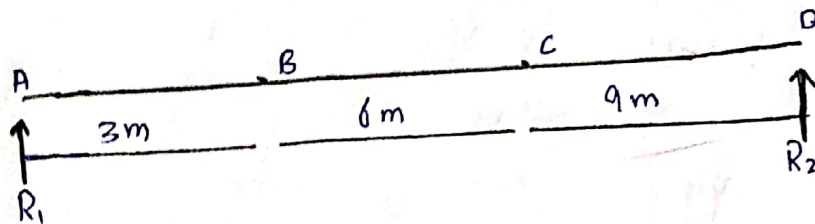
Given data.

$$P_1 = 200$$



$$P_1 = 200 + 16649 = 16849$$

$$P_2 = 500 + 16649 = 17149$$



$$\sum M_A = 0$$

$$-R_2 \times 18 + 17149 \times 9 + 16849 \times 3 = 0$$

$$18R_2 = \cancel{2100} 205888$$

$$R_2 = 11438.22 \text{ units.}$$

$$\sum M_B = 0 \quad (+) \quad (-)$$

P.T.O.

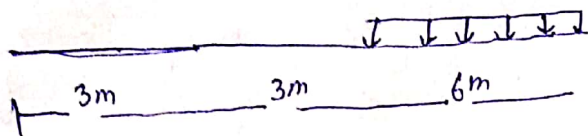
$$R_1 \times 18 - 16849 \times 15 - 17149 \times 9.$$

$$18 R_1 = 98394.$$

$$R_1 = \frac{98394}{18} = 5466.33 \text{ units}$$



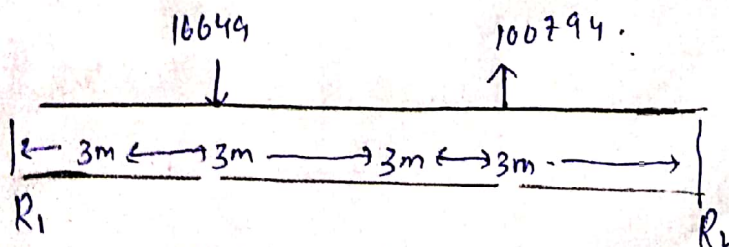
QUESTION #. 2



$$P = 100 + 16649 = 16749 \text{ KN}$$

$$\text{UDL} = 150 + 16649 = 16799 \text{ KN/m}$$

$$= 16799 \times 6 = 100794$$



$$\sum M_A = 0 \quad \curvearrowright \quad \curvearrowleft$$

P.T.O.

$$-R_2 \times 12 + 100794 \times 9 + 16749 \times 3 = 0.$$

$$12 R_2 = 957393.$$

$$R_2 = 79782.75.$$

$$\sum M_B = 0 \quad \curvearrowright \curvearrowleft$$

$$-R_1 \times 12 - 16749 \times 9 - 100794 \times 3 = 0$$

$$\frac{12 R_1}{12} = \frac{49947}{12}$$

$$R_1 = 4162.25$$



$$R_1 = 4162.25$$

Origin A limit $(0 \leq x \leq B)$

$$\sum F_y = 0 \quad \uparrow \downarrow$$

$$R_1 - V_x = 0.$$

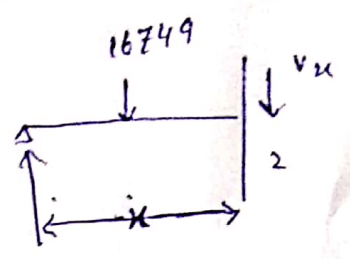
$$V_x = 4162.25 \text{ KN.}$$

Origin A limit $[3 \leq x \leq 6]$.

$$\sum F_y \quad \uparrow + \downarrow$$

$$4162.25 - 16749 - V_x = 0$$

$$V_x = 12586.75 \text{ KN}$$



Origin A limited $[6 \leq x \leq 12]$.

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

$$4162.25 - 16749 - 16799x - V_x = 0$$

$$V_x = 12586.75 - 16799x$$

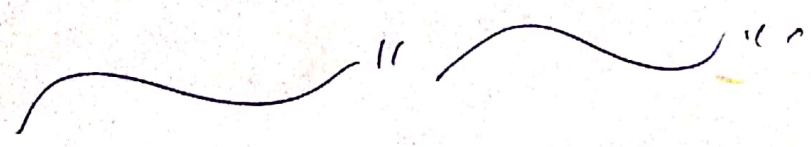
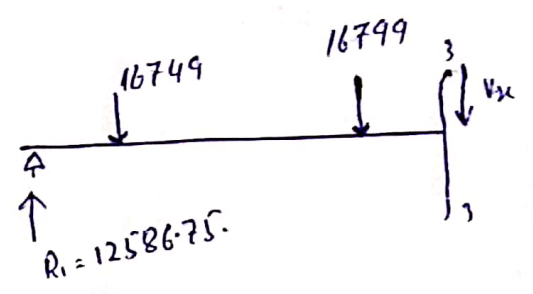
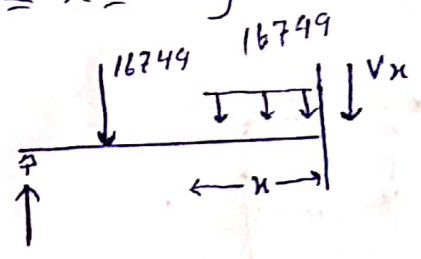
$$V_x = 12586.75 - 16799x$$

[Put value of x]

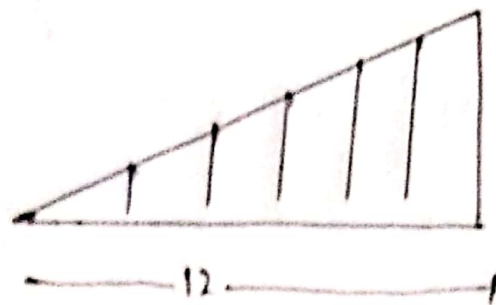
$$\text{for } 0 = 12586.75$$

$$\text{for } 3 = -28526.5$$

$$\text{for } 6 = -77450.5$$

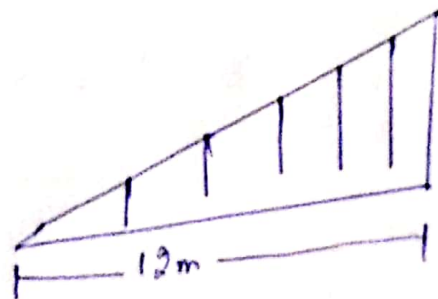


Question #. 3.



$$UVL = \text{KN/m}$$

$$UVL = \frac{16649}{1000} = 16.649 \text{ KN/m}$$



$$W_0 = \frac{16649 \times 12}{2} = 99.894$$



$$\sum MA = 0$$

$$-R_2 \times 12 + 99.894 \times 8 =$$

$$\frac{12R_2}{12} = \frac{799.152}{12}$$

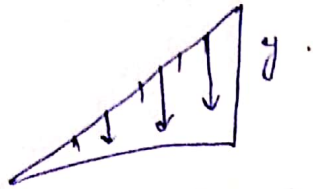
$$R_2 = 66.596 \text{ KN.}$$

$$\sum M_B = 0 \quad \rightarrow \quad \leftarrow$$

$$R_1 \times 12 - 99.894 \times 4 = 0$$

$$\frac{12 R_1}{12} = \frac{399.576}{12}$$

$$R_1 = 33.298 \text{ KN}$$



To find "y"

By Angle of Similarity.

$$\frac{x}{y} = \frac{12}{16.649}$$

$$\frac{16.649 x}{12} = y$$

$$y = 1387.41$$

$$W_0 = \frac{1}{2} (y)(x)$$

$$= \frac{1}{2} (1387.41)(x)$$

$$W_0 = 693.705$$

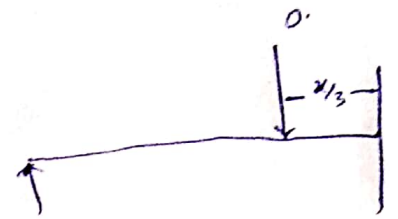
Origin: A.

Limit $[0 \leq x \leq 12]$.

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

$$32.316 - 0.693 \cdot 705 x^2 - Vx = 0.$$

$$Vx = 32.316 - 693.705 x^2$$



$$\sum M_{i-1} = 0 \quad \curvearrowright + \quad \curvearrowleft -$$

$$32.316 x - 693.705 x^2 \cdot \frac{x}{3} - Mx = 0.$$

$$Mx = 32.316 x - 693.705 x^2 \cdot \frac{x}{3}$$

x length	V _x (kN)	M (kN·m)
0	32.316	0
6	2.0772	399.32
6.93	0	149.267
12	64.632	0

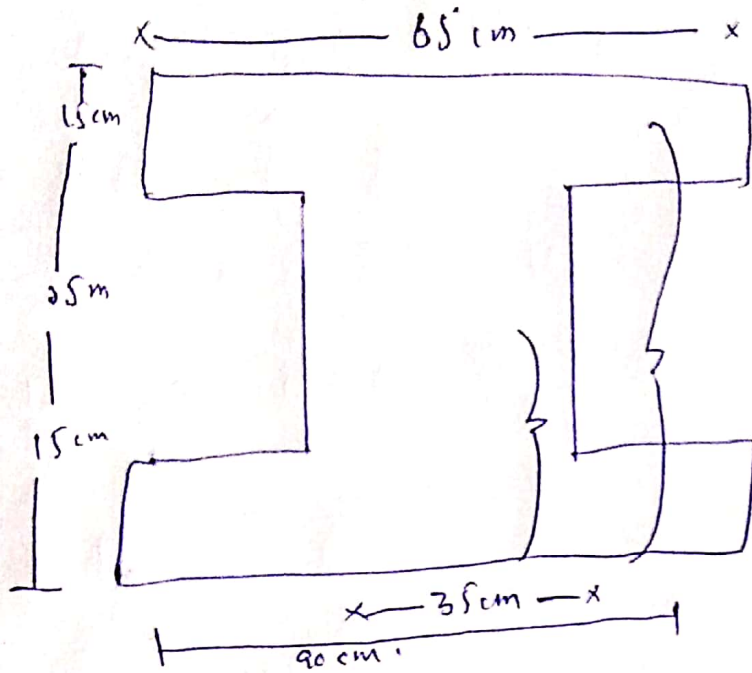
$$32.316 - 0.6733 x^2 = 0$$

$$\frac{32.316}{0.6733} = \frac{0.6733 x^2}{0.6733}$$

$$\sqrt{x^2} = 48 = 6.93 \text{ m}$$

QUESTION # 84

100



$$a_1 = 65 \times 15 = 975 \text{ cm}^2$$

$$a_2 = 16 \times 35 = 560 \text{ cm}^2$$

$$a_3 = 90 \times 15 = 1350$$

$$y_1 = 15/2 = 7.5 \text{ cm}$$

$$y_2 = 15 \times 65/2 = 47.5 \text{ cm}$$

$$y_3 = 20 \times 15/2 = 150 \text{ cm}$$

$$y = \frac{\sum ay}{\sum a}$$

$$= \frac{a_1 y_1 + a_2 y_2 + a_3 y_3}{a_1 + a_2 + a_3}$$

D.T.O.

QUESTION # 5

Explain work, energy and Power in detail along with Practical example ?

WORK.

The Product of force and displacement is called work.

A force is said to be positive work when the applied force has a component in the direction of the displacement of the point of application.

And a force does negative work if the force component opposite to the direction of displacement at the point of application of the force.

For Example: When a ball is held above the ground and then dropped, the work done by the gravitational force on the ball as it falls is equal to weight of the ball (force) multiply by the distance to the ground (displacement). When the force (F) is constant and the angle b/w the force and displacement S is θ then the work done is given by $W = FS \cos \theta$

SI unit is joule (J)

Energy.

The ability of a body to do work.
or.

The capacity for doing work.

It may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or in other various form. i.e. Energy is the process of transfer from one body to other.

Example: light energy, heat energy, mechanical energy, gravitational energy, chemical energy.

We divide our energy use among four economic sectors, Residential, Commercial, Transportation and Industrial, Heating and cooling our home lighting office, building, driving and manufacturing the products that we really use in our daily lives are function that require energy.

SI unit = joule



Power.

The rate of doing work, It is the work done in unit time. The SI unit of power is watt (W). which is (J/s).

Some time the power of motor vehicle and other machine are given in term of Horsepower (hp). which is approximately equal to 745.7 watts.

Example.

- 1) Power is the Strength needed to run five miles.
- 2) Power is the Authority a local government has to collect taxes.

Question 4.8.

Part. B.

Given data.

$$\text{area} = 65 \text{ cm} \times 35 \text{ cm}.$$

① To find moment of inertia.

② Radius of Gyration.

③ Section Modulus.

① for moment of inertia.

$$I_x = \frac{1}{3} b h^3$$

$$I_x = \frac{1}{3} (65) \times (35)^3$$

$$= \frac{1}{3} (65) \times (35)^3$$

$$\boxed{I_x = 928958 \text{ mm}^4.}$$

$$I_y = \frac{1}{3} b^3 h$$

$$I_y = \frac{1}{3} (65)^3 (35)$$

$$\boxed{I_y = 3203958 \text{ mm}^4}$$

$$I_x = \frac{1}{12} b h^3$$

$$= \frac{1}{12} (65) (35)^3.$$

$$\boxed{I_x = 6635.41 \text{ mm}^4}$$

Part. B. Continue.

$$I_{yc} = \frac{1}{12} b^3 h$$

$$I_{yc} = \frac{1}{12} (65)^3 (35) = 800989 \text{ mm}^4$$

$$I_{x1} = \frac{1}{12} bh (b^2 + h^2)$$

$$I_c = \left[\frac{1}{12} (65) (35) (65)^2 + (35)^3 \right]$$

$$I_c = 1033229.16 \text{ mm}^4$$

Radius of Gyration.

$$v = \left(\frac{I_c}{A} \right)^{1/2}$$

$$A = b \times d$$

$$A = 65 \times 35$$

$$A = 2275$$

$$v = \left(\frac{1033229.16}{2275} \right)^{1/2} = v = 21.31 \text{ mm}$$

Section Modulus.

$$s = \frac{bh^2}{6}$$

$$s = \frac{(65)(35)^2}{6}$$

$$s = 13270.83 \text{ mm}^2$$

The END.