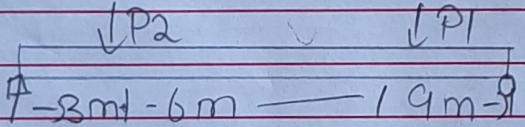
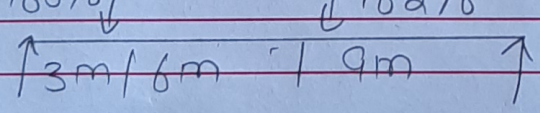
ID#16076 Section: 'A' Paper: final
Submited to: Sir, MAJID NAEEM
Subject: Engineering mechanics.

① Find the support reaction, show all your calculation. (P1 = 200+ID) P2 = 500+ID).



Sol:- P1 = 200+16076 = 16276
P2 = 500+16076 = 16576



~~RA+RB~~ Sign convention

RA+RB-16576-16276=0
RA+RB=32852 → ①

EMB=0
(RA x 18)-(16576x15)-(16276x9
RA x 18 = 395124
RA = 395124/18 = 25678

Putting the

~~RA = 2~~

RA = 256778

Putting the value of RA into equation ①

256778 + RB = 32856

RB = 32856 - 256778

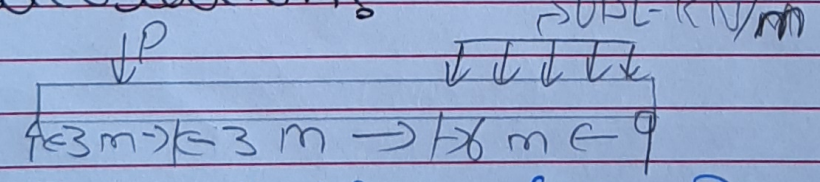
RB = 223922

~~RB~~ =

16576 16276

256778 223922

② Draw the net shear force Daigram, Show all your Calculations?



sol:- Calculation for P

P = 100 + 1D

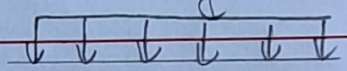
P = 100 + 16076 = 16176

for UDL.

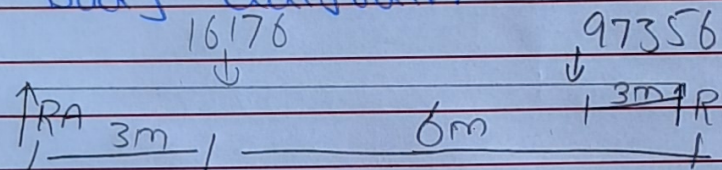
UDL = 150 + 16076 = 16226

So,

$16226 \times 6 = 97356$



Free body daigram.



↑+ ↓−

$\Sigma F_y = 0$

$RA + RB - 16176 - 97356 = 0$

$RA + RB = 113532\ KN$ —(i).

$\Sigma M_B = 0$

$(RA \times 12) - (16176 \times 9) - (97356 \times 3) = 0$

$RA = \frac{(16176 \times 9) + (97356 \times 3)}{12}$

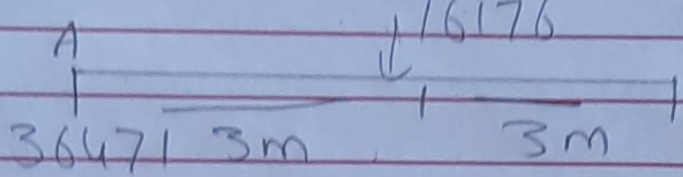
$RA = 36471\ KN$

Putting value in equation (i)

$36471 + RB = 113532$

$RB = 113532 - 36471$

$\boxed{RB = 77061\ KN}$



at x=0

So,

VAA = 36471 KN

at x=3

V = 36471 - 16176

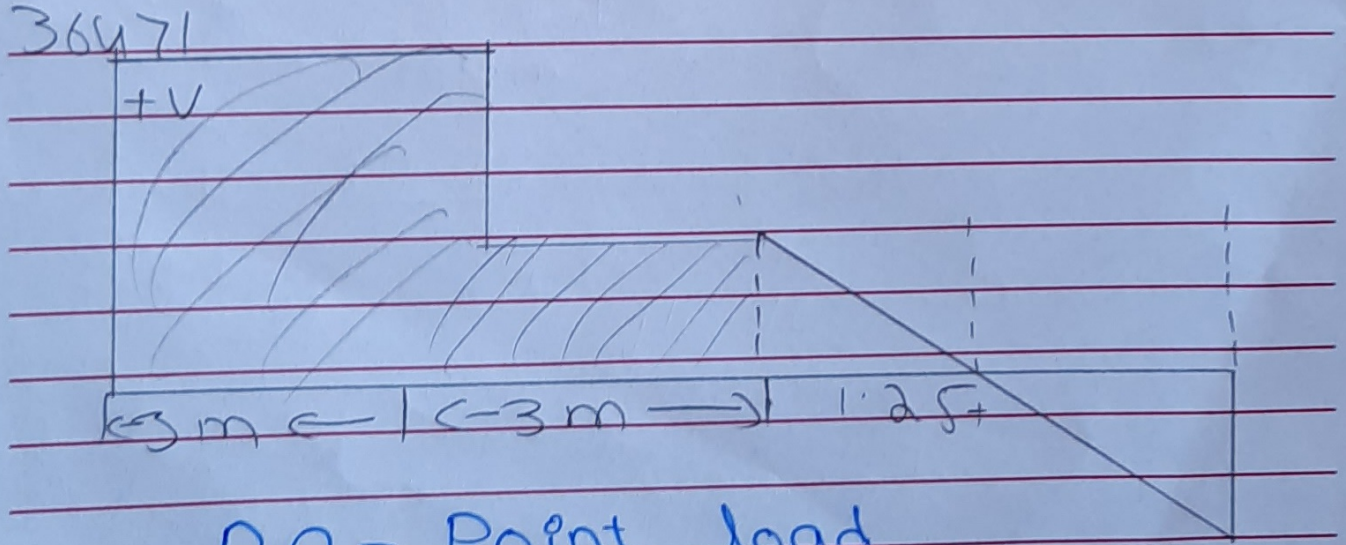
at x=6

V = 36471 - 16176

at x=12

Vbb = 36471 - 16176 - (16226 x 6) + 77061

Vbb = 0

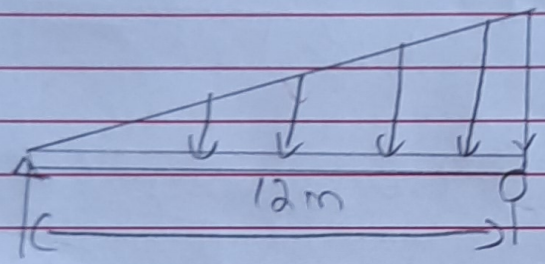


RA - Point load

20246 - (16226 x x) = 0

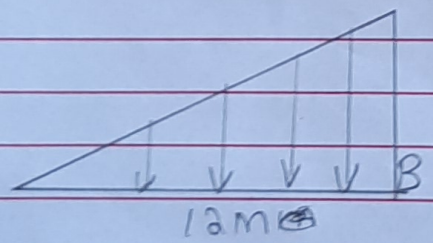
x = 20246 / 16226 = x = 1.247

③ Draw a net shase force and bending moment Daigram, Show all your calculation. (UVL = Student ID No/1000).

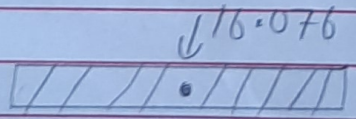


UVL-1CN/m

Sol:

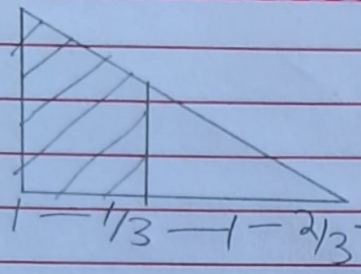


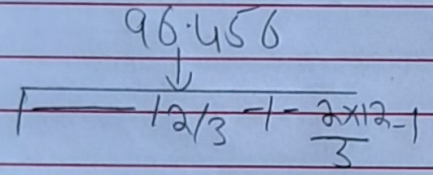
$UVL = \frac{16076}{1000} = 16.076$



$\frac{1}{2} \times b \times h = \frac{1}{2} \times 12 \times 16.076$

$w = 96.456.$





$R_A + R_B = 96.456$ KN → (1)

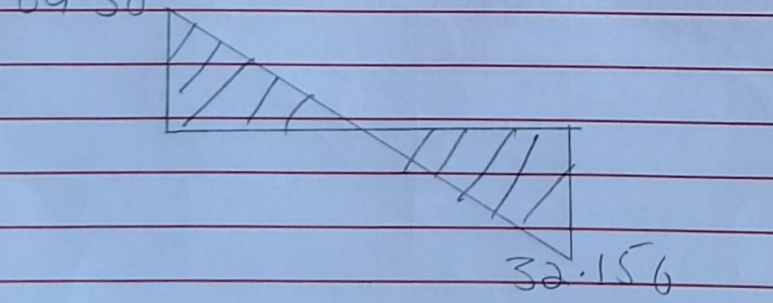
$(R_A \times 12) - (96.456 \times 8) = 0$

$R_A = 64.30$ Put in (1)

$R_A + R_B = 96.456$

$64.30 + R_B = 96.456$

$R_B = 32.156$



at $x = 0$

$V = 64.30$

$V = 64.30 - (1/2) \times (x) \times 16.076 \times x$

2

$$V = 64.30 - \frac{x}{2} \times \frac{16.076\, x^2}{12}$$

$$V = 64.30 - 16.67\, x^2 = 0$$

$$\frac{64.30 \times 24}{16.31} = x^2$$

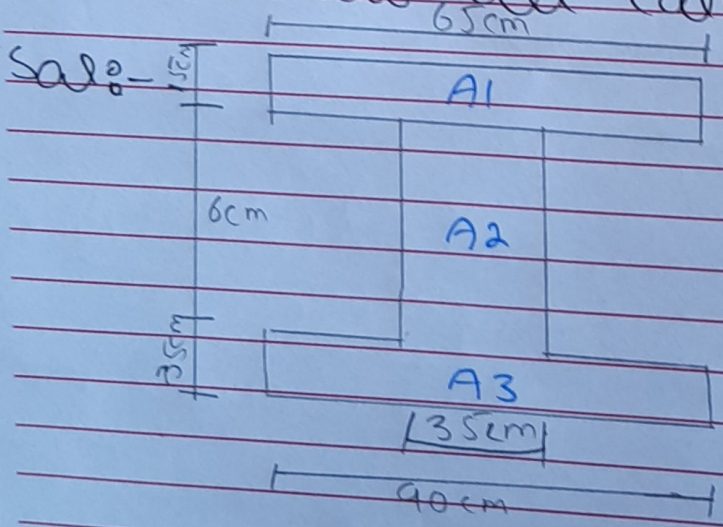
$$96.02 = x2$$

$$\sqrt{96.02} = \sqrt{x^2}$$

$$\boxed{x = 9.798}$$

Q:- Find centoid of the given shape, Show all calculation.

Sol:-



17.5+5+5

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$A_1 = 975 cm^2$ $\quad y_2 = 17.5$

$A_2 = 2275 cm$ $\quad y_2 = 67.5$

$A_3 = 3150 cm$ $\quad y_1 = 107.5$

$$\bar{y} = \frac{\Sigma y_i A_i}{\Sigma A_i} = \frac{A_1 y_1 + A_2 y_2 + A_3 y_3}{A_1 + A_2 + A_3}$$

$$= \frac{(975 \times 107.5) + (2275 \times 67.5) + (3150 + 17.5)}{975 + 2275 + 3150}$$

$$\bar{y} = 48.98 cm$$

$A_1 = 975$ $\quad x_1 = 45 cm$

$A_2 = 2275$ $\quad x_2 = 17.5 cm + 15 + 12.5 = 45 cm$

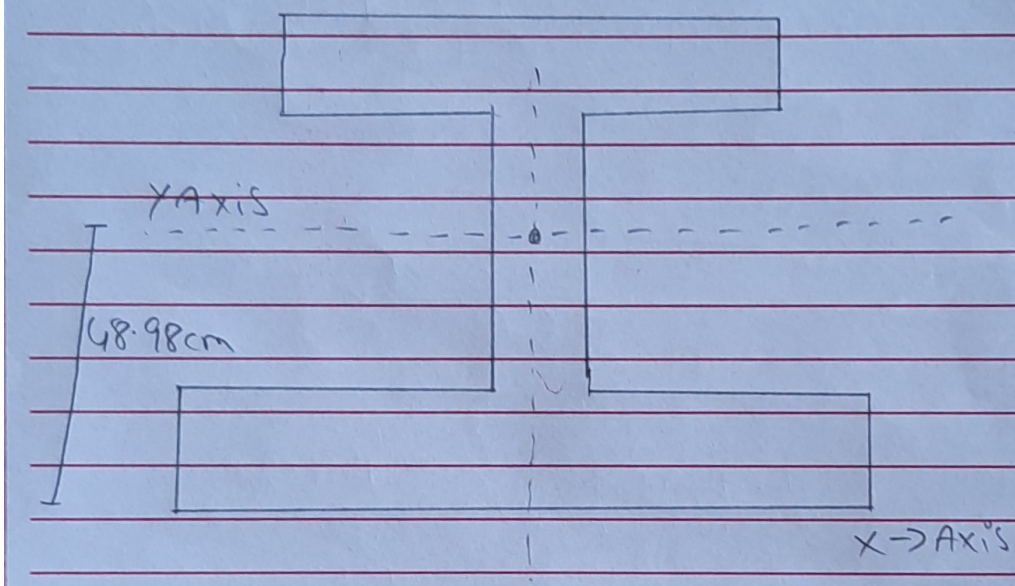
$A_3 = 3150$

$$\bar{x} = \frac{\Sigma x_i A_i}{\Sigma A_i} = \frac{A_1 x_1 + A_2 x_2 + A_3 x_3}{A_1 + A_2 + A_3}$$

$$= \frac{(975 \times 45) + (2275 \times 45) + (3150 \times 45)}{975 + 2275 + 3150}$$

$$\boxed{\bar{x} = 45 cm}$$

A.P Notes



B) For mid Area (65cm×35cm) only find the moment of inertia, Radius of Gyration and Section Moduli.

Sol:- Moment of Inertia

$$I = bh^3/12$$

$$I = 35 \times (65)^3/12$$

$$I = 800989 \text{ cm}^4$$

Radius of Gyration

$$r = \sqrt{\frac{I}{A}}$$

$$r = \sqrt{\frac{800989.5833}{2275}} = \boxed{18.76\text{cm}}$$

Section Moduli.

$Bh^2/6$

$$\boxed{S = 24645.83\ \text{cm}^3}.$$

(5) Explain work, energy and Power in detail along with Practicle example from daily life. (Marks 10, CLO-01). ?.

Ans:- Work: The application of a force through certian distance is known as work measured in joule. $W = F \cdot d$

W is the work done. (j)
F is force applied (N)
D is the distance (m)

Example: a box is Pushed across a floor by a constant force of 100 N. what is the work done by the force to move the box 5m.

Sol: $W = F \cdot S \Rightarrow W = 100 \times 5 \Rightarrow W = 500 \cdot J$.

Energy: Energy is the measure of ability of an object or a system to Perform work. it,s unit is joule.

TYPES.

1) Kinetic energy
2) Elastic energy.

3) Nuclear energy.
4) Gravitational Potential energy.
5) Chemical energy.

1 joule = 1 N·m

i) Kinetic energy: Energy of an object due to its speed.
2) Gravitational Potential energy: Energy of an object due to Position in a Gravitational field
3) Elastic Potential energy: energy stored when an Object is stressed or compressed.
4) Chemical Energy: Energy stored in chemical bond.
5) Nuclear energy: energy stored in nuclie.
6) Heat energy: Hot thinks have more energy then thier cold counter Part.

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

Power = work done / time take

P = w/t.

Where Power is measured in watt. (w).

Power example: A crane lift a load of 500 kg to a hieght of 25m at a steady rate in a time of 2min. What is the Power of the crane?

Sol: W = energy transferd ΔEP

$\Delta EP = mg\Delta h$

$W = 1500 \times 9.81 \times 25$

$W = 367875$ j

$P = W/t$

$P = 367875/120$

$P = 3066$ w Ans.