Day: M T W

"MID TERM EXAM"

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I.D → 7666

Section → C

Subject → Steel Structure

Submitted to #

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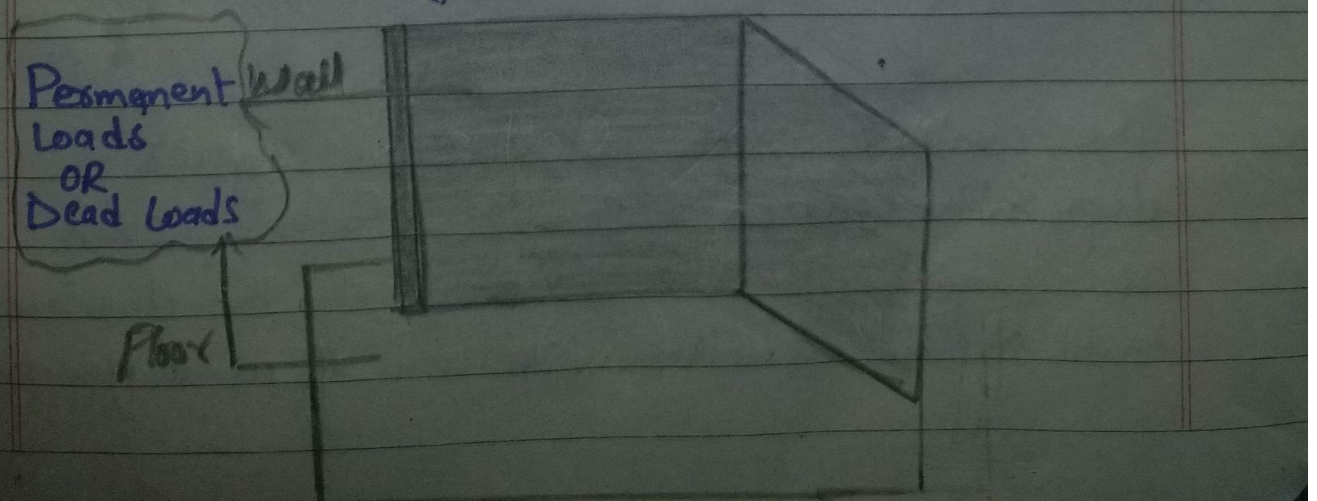
Qu write a detail note on your own words on different types of load that different type of structures are designed to support pts. Elaborat with example?

Types of Loads on structure:-

There are following types which are given below.

1- Dead Load :-

Dead load consist of self-weight of the structure (weight of walls, floors, roofs etc). The weight of the foundation and footings and all other permanent load acting on the structure. These can be computed by finding the weight of cubical contents of the different materials used for counstructing the structure.



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2 ⇒ Live loads:-

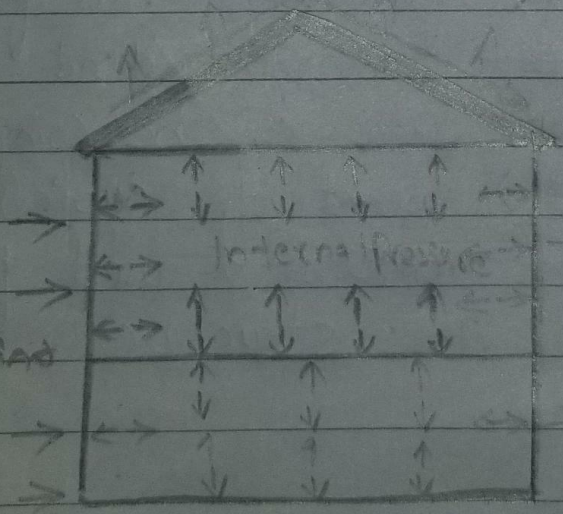
Live loads consist of moving or variable loads like people furniture, temporary stores etc. It is also called super-imposed load.

Example:-

People, furnitures, Materials.

3- Wind loads:-

The wind acts horizentaly on the surfaces of the walls, roofs and inclined roof of the structure. That means it exerts uniformly pressure on the structural components on which it acts and tends to disturb the stability of the structure.



The value of wind load varies depending upon several factors such as geographical location of the structure height of the structure, duration of wind flow etc.

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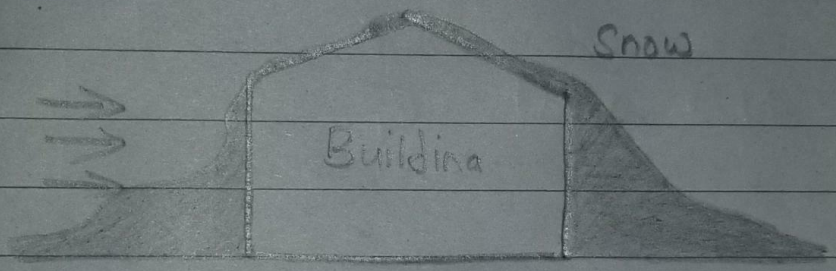
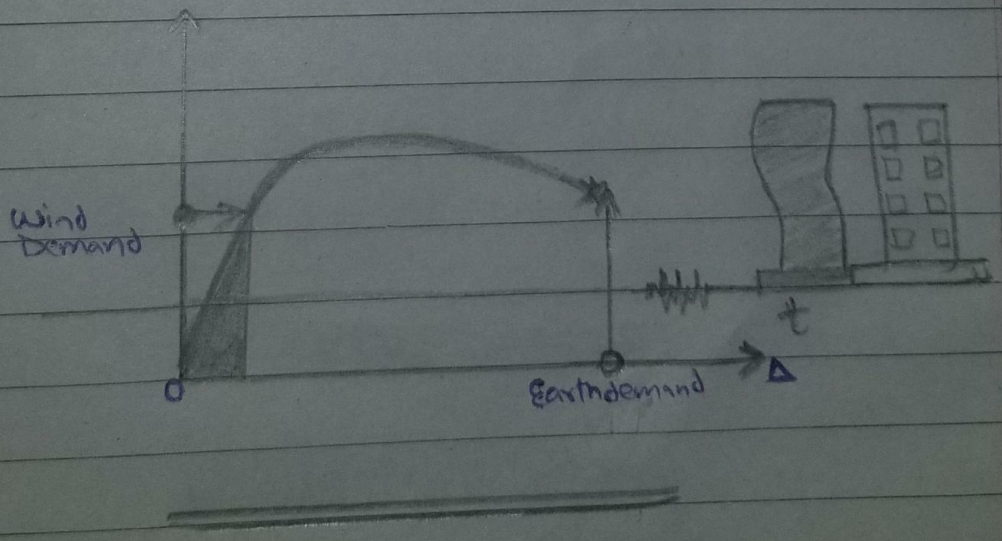
4- Snow load :-

The amount of snow load depends on various factors such as shape and size of roof structure, roofing materials, location of the structure, duration, and frequency of snow



5- Seismic load :-

These load are internal forces which act on the structure due to earthquake developed ground movements



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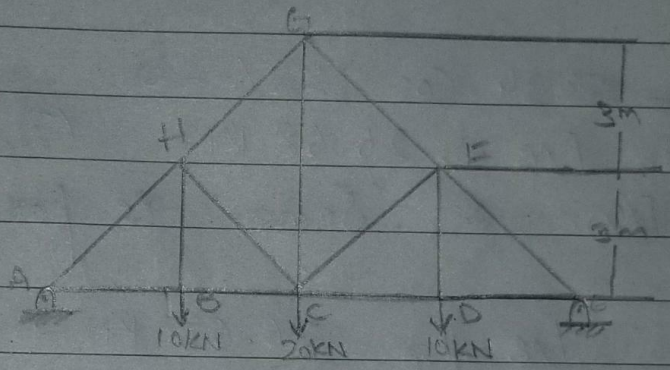
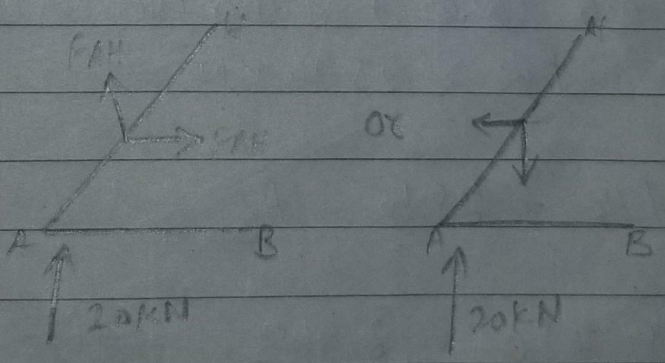
Q Determin the force in (which) each member of the truss. State if the member are in tention or compression Assume all members are pin connected.



Joint A



$\Sigma F_x = 0$ → +ive ← -ive

$F_{AB} - F_{AH} \cos\theta = 0$

as

for $\theta \Rightarrow \tan\theta = 3/4$

or

$\theta = \tan^{-1}(3/4) \Rightarrow \theta = 36.86°$

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Pg (5)

$F_{AB} - F_{AH} \cos 36.86 \rightarrow (a)$

$\Sigma F_y = 0$ ↑ +ve ↓ -ve

$20 - F_{AH} \sin 36.86 = 0$

$F_{AH} = \frac{20}{\sin 36.86} = 33.34$ KN. (C) P.T.V in eq (a)

$F_{AB} - 33.34 \cos 36.86 = 0$

Or $F_{AB} \Rightarrow 26.68$ KN (T)

$F_{(AB)} =$ "Same Ps for Joint D"

as $F_{AB} = F_{ED} = 26.68$ KN (T)

$F_{AH} = F_{HC} = 33.34$ KN (C)

$-10 - 0.6 F_{HG} + 0.6 F_{HC} = 0$

$-10 - 0.6 (8.443) + 0.6 F_{HC} = 0$

$F_{HC} = 25.10$ KN

So

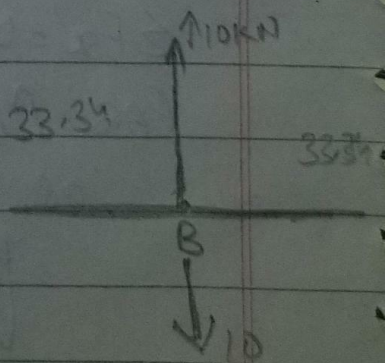
$F_{HC} = 25.10 = F_{DF}$

$F_{HG} = F_{GF} = 8.443$ (C)

Joint B:-

$\Sigma F_x \neq 0$ $F_{BF} = 20$ KN (T)

$\Sigma F_y = 0$ $F_{BH} = 10$ KN (T)



As for

$F_{BH} = F_{OD} = 10$ KN (T)

$F_{BC} = F_{CD} = 33.34$ KN (T)

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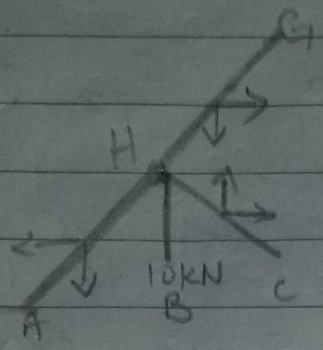
Now joint "H"



$\Sigma F_x = 0$ $\xleftarrow{-ve}$ $\xrightarrow{+ve}$

$-33.34 \cos 36.87 + F_{HG} \cos 36.87 + F_{HC} \cos 36.87 = 0$

$-26.67 + 0.8 F_{HG} + 0.8 F_{HC} = 0 \longrightarrow (b)$

$\Sigma F_y = 0$ $\uparrow$ +ve $\downarrow$ -ve

$10 - 33 \sin 36.87 - 0.6 F_{HG} + 0.6 F_{HC} = 0$

$-10 - 0.6 F_{HG} + 0.6 F_{HC} = 0 \longrightarrow (c)$

For F_{HC}

$$F_{HC} = \left(\frac{10 + 0.6 F_{HG}}{0.6} \right)$$ P.T in eq

$$-26.67 + 0.8 F_{HG} + 0.8 \left(\frac{10 + 0.6 F_{HG}}{0.6} \right) = 0$$

$-26.67 + 0.8 F_{HG} + 13.33 + 0.78 F_{HC} = 0$

O.R

$F_{HG} = 8.443$ KN

P.T in eq (c)

$-10 - 0.6 F_{HG} + 0.6 F_{HC} = 0$

$-10 - 0.6 (8.443) + 0.6 F_{HC} = 0$

$F_{HC} = 25.10$ kN (C)

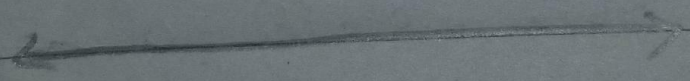
So $F_{HC} = 25.10 = F_{DF}$ (C)

$F_{HG} = F_{GF} = F_{DF}$

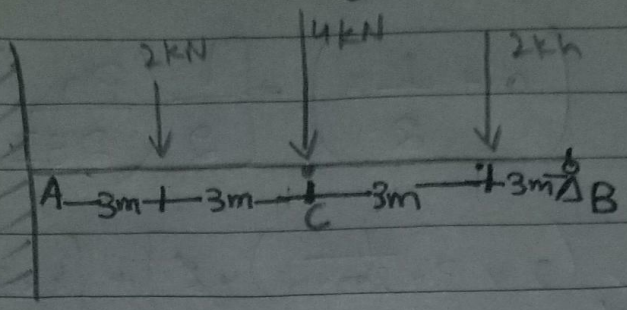
$F_{HG} = F_{GF} = 8.443$ (C)

Now Joint G

$F_{GC} = 20$kN



Q3 Determine the slope at A and displacement at C of the beam in figure



By Moment Area Theorm ⇒

Take $E = 200\ GPa$

$I = 6(10^6)\ mm^4$

Solution :-

Slop (A) ⇒ ? displacment (C) = ?

At

$$\theta_{BC} = \frac{1}{2}(Pa/CI)$$

$$\theta_{BC} = \frac{1}{2}\left(\frac{4\times3}{200\times10^9\times6\times10^{-5}}\right)^3 + \left(\frac{4\times3}{200\times10^9\times6\times10^{-3}}\right)\times3$$

$$+\frac{1}{2}\left(\frac{2\times3}{2\times200\times10^9\times6\times10^{-3}}\right)$$

$$\theta_{AC} = \frac{1}{200\times10^3}\left[\left(\frac{3}{2}(4\times3)\right) + (12\times3) + \frac{3}{2}\left(\frac{6}{2}\right)\times3\right]$$

$$\boxed{\theta_{AC} = 0.00008925}$$

$$t_{BC} = \left[\frac{1}{2}\left(\frac{Pa}{EI}\right)a\right]\left(\frac{2}{3}a\right) + \left[\frac{Pa}{EI}(a)\right]\left(a + \frac{1}{2}a\right) + \left[\frac{1}{2}\left(\frac{Pa}{2EI}\right)a\right]\left[a + \frac{2}{3}a\right]$$

$$t_{BC} = \left[\frac{3}{2}\left(2 \times 3 \times \frac{1}{200 \times 10^4}\right) \times 2\right] + \left[4 \times 3 \times 3 \times \frac{1}{200 \times 10^4}\right] * \left(3 + \frac{3}{2}\right)\Bigg] + \frac{3}{2}\left(\frac{2 \times 3}{2} \times \frac{1}{200 \times 10^4}\right) \times (3+9)$$

$$t_{BC} = 9 \times 10^{-6} + 8.1 \times 10^{-5} + 1.125 \times 10^{-5}$$

$$t_{BC} = 1.0125 \times 10^{-4}$$

OR

$$\boxed{t_{BC} = 0.00010125}$$