SUBMITTED BY

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ID 7907

SECTION A.

SUBJCT STRUCTURE ANALSIS

SUBMITTED TO

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ANSWER TO QUESTION NO 1 :-

LOAD :- Load is the external forces acting on very small area on a perpendicular point of a supporting structure elements.

As we know that when the dimentional requirement for a structure has been defined. It become nessessory to determine the load structure must support - There are various type of load which will imposed on the structure that provide the basic type of structure that will be chosen for design.

For example high rise structure must endure large lateral loading caused by wind and so shear wall & tabular frame system are selected where as building located in area prone to earth quakes must be design have ductile frames & connector.

Types of load:

Primary loads on Building have two types.
① Stadic load ② Dyanamic load.

→ Stadic load have Dead or Live load.
Then Dead load are also in 2 parts.
one is structure self weight and another is permenard fixture. while Live load have either people load or Temperory fixture.

→ Dynamic have also divided into two parts ① wind ② Seisemic.

Now we will explain in details.

① DEAD LOAD :-

Dead load consist of Selfweigh of structure (Beam, colums, slab & equipment which is permanetly attached to structure
→ Such as Capboard which is fixed etc. and the weight of column, beams, girders & roof slab, floor slab, windows, Doors etc.

LIVE LOAD:

Load caused by contents of objects with in or on a building are called occupancy load this load includes allowance for the weight of people moveable partitions mechanical equipment etc.

Live load can vary both in their magnitude & location. they may be caused by the weight of the object temporarily placed one structure moving verticles or natural forces-

① WIND LOAD :- When the speed of the wind is high it cause the massive damage to structure.

wind exerts three type of forces on a structure. wind flow pressure that react on strong Lifting effected much like the effect on airplane wings.

BUILDING LOADS:-

Buiding load is simply a force that a houce frame needs to resist the fram. must be designed to with stand mugn of these load in which wind & snow etc are present.

The floor of the buidig are assumed to be subjected to uniform live load which depand on the purpose on which the building is design.

HIGHWAY BRIDGE LOADS:-

The primary live loads on Bridge Spans are those due to traffic & the heaviest vechicle loading encountered is that caused by a series of trucks.

The major load components of highway bridges are dead load, live enviromental load & others.

IMPACT LOADS:-

An Impact load is one whose time of application on a materials is less than one third of the natural period of vibration of that materials cyclic loads on a structure can lead to fatigue damage, cumulative damage, or failure. These loads can be repeated loading on a structure or can be due to vibration.

SNOW LOAD:

Snow load constitute to the vertical loads in the building but these load are considered only in the snowfall plans.

The minimum snow load on a roof area or any other area above ground which is subjected to snow accumulation is obtained by the expression.

⇒ How Load transfer:

Load → Roof Surface → Roof Slab → Beams → Columns → foundation → Sub Soil.

Foundation transfer all load safetly to ground.

STRUCTURE :-

A structure refer to a system of connected parts used to support a load is called structure.

⇒ TYPES OF STRUCTURE :-

① TRUSSES :-

→ A trusses is a structural comprising one or more triangular units constructed with straight member whose ends are connected at points or nodes.

→ if all the bars lies in a plane the structure is a planar trusses.

Different types of Trusses :-

→ Perfect truss $m = 2J-3$

→ Deficient Trusses $m < 2J-3$

→ Redundant truss $m > 2J-3$.

$\therefore$ m = member.

J = joints.

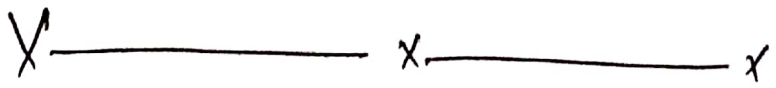
CABLE AND ARCHES :-

Cable and arches are closly related to each other & hence they are grouped in this course in the same module. For long span structure .. Soch that incase of brigdn engineers commonly use cable or arch construction due to these efficiency.

FRAMES :-

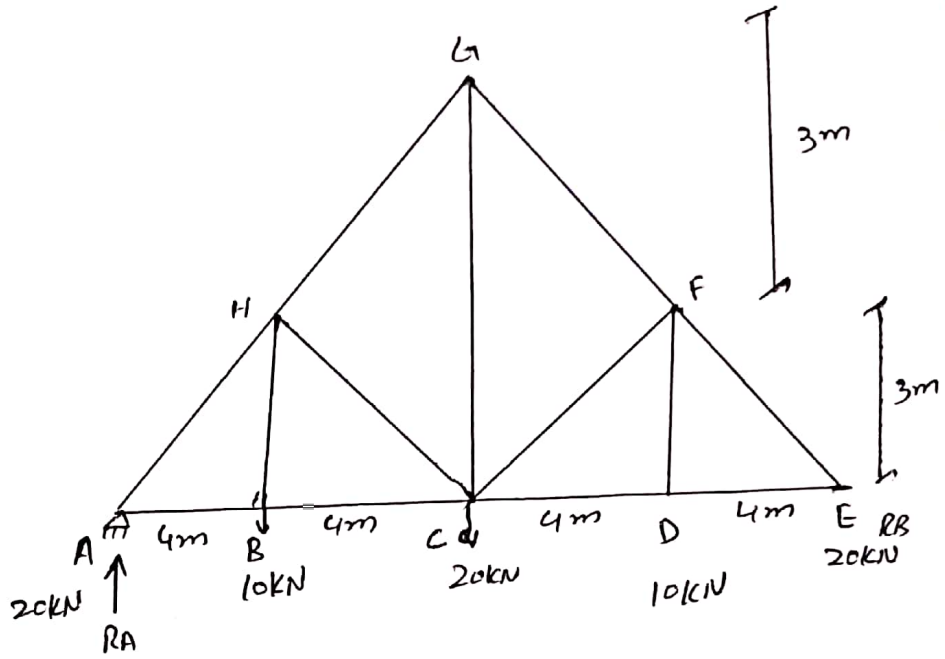
Frames are often in building & are open composed of beams & columns that are either pin or fixed connector.

The loading on a frame caused bending of it's member & it has a rigid joint connection.



QUESTION NO2:

Determine the forces in each member of the truss State if the member are in tension or compression. Assume all member are pin connected



SOLUTION:-

First we find Support Reaction.

$\Sigma F = 0 \quad \uparrow^{+} \quad \downarrow^{-}$

$RA + RB = 40$

$\Sigma M = 0 \quad \circlearrowleft^{-} \quad \circlearrowright^{+}$

$-RB \times 16 + 10 \times 12 + 20 \times 8 + 10 \times 4 = 0$

$-16RB + 120 + 160 + 40 = 0$

$16RB = 320$

$\frac{16RB}{16} = \frac{320}{16}$

$\boxed{RB = 20}$

As

$R_A + R_B = 40$

then

$R_A = 40 - 20$

$\boxed{R_A = 20}$

⇒ To find angle

As we know that this structure is symetrical - than. So,

$R_A = 20, \; R_B = 20$

angle:

$\theta_A = \tan^{-1}(3/4)$

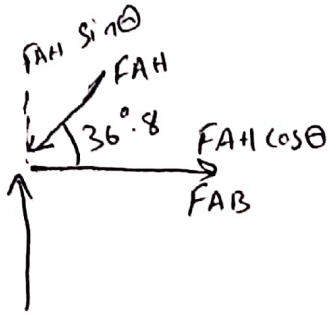
$\theta_A = \tan^{-1}(0.75)$

$\theta_A = 36.87°$

Now Analysis of joints:-

Joint A

$\Sigma F_y = 0 \quad (+\uparrow)$



$20 = F_{AH} \sin 36.87$

$F_{AH} = \frac{20}{\sin 36.87}$

So,

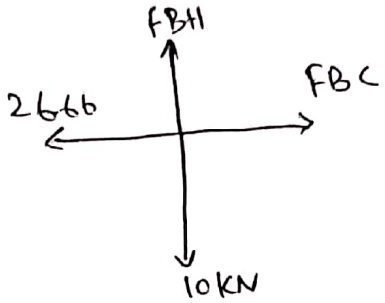
$\boxed{F_{AH} = 33.33 KN}$

$\Sigma F_x = 0 \quad \rightarrow +$

$F_{AB} = F_{AH} \cos 36.87$

$\boxed{F_{AB} = 26.66\ KN}$

JOINT # B



$\Sigma F_x = 0$

As we know that

Directly

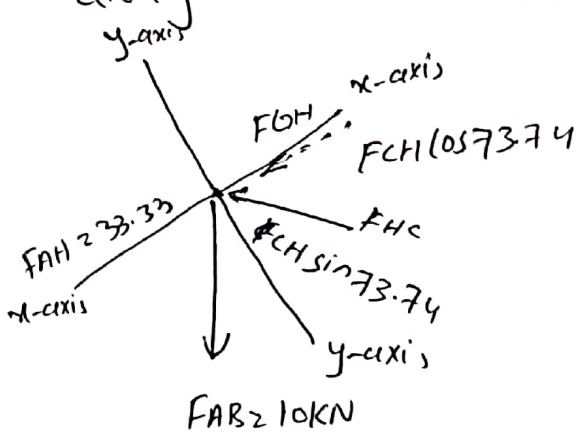
$F_{BC} = 26.66\ KN \quad (T)$

$\Sigma F_y = 0$

$F_{BH} = 10\ KN$

$\Rightarrow$ JOINT # H

As orientation of x-axis along AG, we get.



As we know that the angle between FAH & FCH is

$\boxed{73.74^\circ}$

& the angle b/w FAH & FBH is $\boxed{53.13} \Rightarrow \tan^{-1}(1.33) = 53.13^\circ$

Now $\Sigma F_y = 0$

$F_{CH} \sin 73.74 = 10 \sin 53.13$

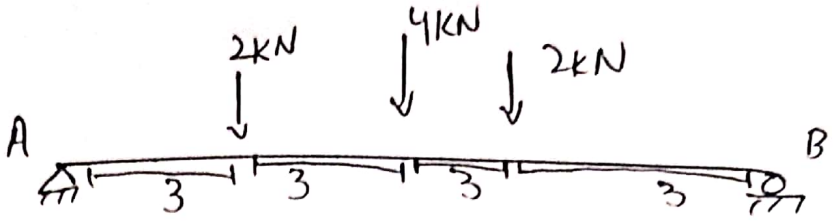
$\Sigma F_y = 0$

$F_{CG} = +20 + 8.33 \sin(36.87) + 8.33 \sin(36.87)$

(P11)

$$\boxed{F_{CG} = 30 \text{ KN}}$$

ANSWER TO QUESTION NO 3:-



Required data:

Slope at A = ?

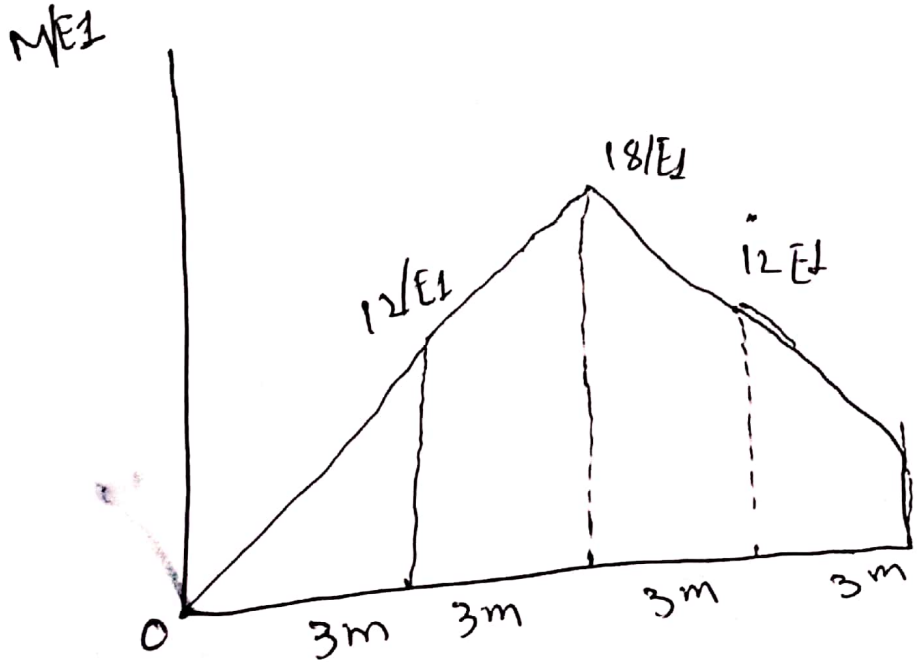
Displacement at C = ?

while Given data is

$E = 200\ GPa = 200 \times 10^9\ Pa.$

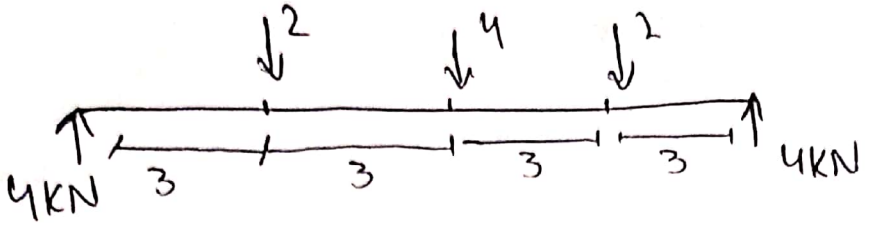
$I = 6 \times 10^6\ mm^4 = 6 \times 10^{-6}\ m^4$

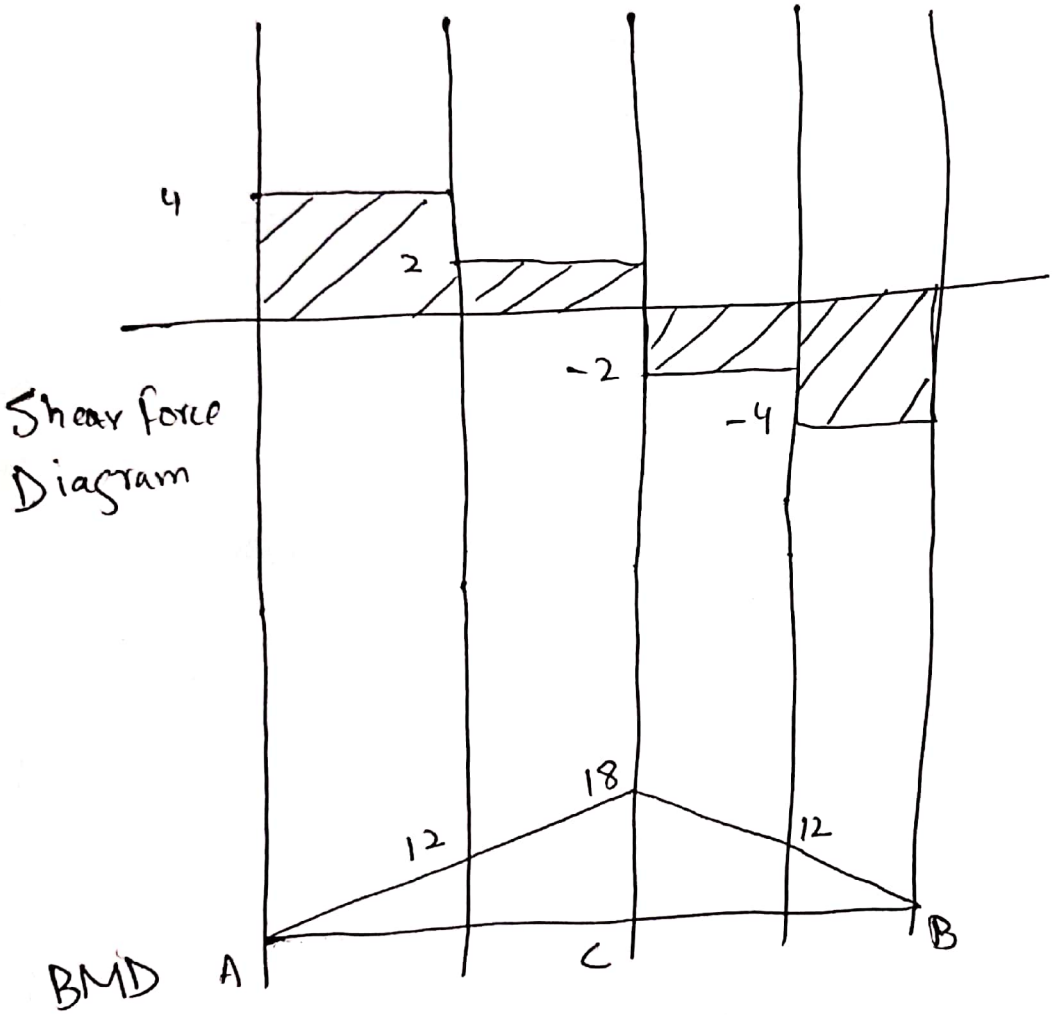
Moment Diagram:



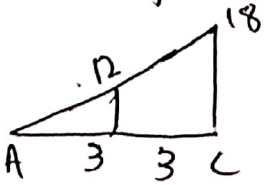
As beam is symmetric, Thus

$$R_A = R_B = \frac{2+4+2}{2} = 4KN.$$





$\theta_A \Rightarrow$ Area b/w point A & C.



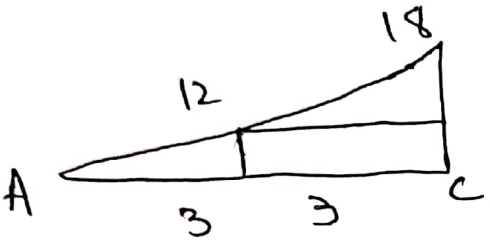
$$\theta_A = \left(\frac{12 \times 3}{2}\right) + \left(\frac{12+18}{2}\right) \times 3$$

$$= 63/EI \ (KN \cdot m^2).$$

$$\theta_A = \frac{63 \times 10^3}{200 \times 10^9 \times 6 \times 10^{-6}}$$

$$\boxed{\theta_A = 0.0525 \text{ rad}}$$

Now Δ_C will be equal to first moment of area b/w points A & C.



$$\Delta_C = \frac{2}{3} \times 3\left(\frac{12 \times 3}{2}\right) + \left[(3+\tfrac{3}{2})(12 \times 3)\right] + \left[(3+(\tfrac{2}{3} \times 3)\right]\left(\frac{3 \times 6}{2}\right)$$

$$\Delta_C = 36 + 162 + 45$$

$$\Rightarrow 243 \text{ KN.m}^3/EI$$

$$\Delta_C = \frac{243 \times 10^3 \text{ m}^3}{200 \times 10^9 \times 6 \times 10^{-6}}$$

$$\boxed{\Delta_C = 0.2025 \text{m}}$$