ID # 7510

Sec # C

lecturer # Amjad Islam

Module # 10th Semester.

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Question # 1

Write a detail note in your word on different types of load that different types of structures are designed to support throughout its life. Elaborate with Examples.

Ans) The types of load acting on structure for different buildings and the structure are classified as vertical loads, horizental loads and longitudional load.

→ The vertical loads consists of dead load, live load.

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> The horizental load compresses of wind load and earthquake load.

> The longitudional load i.e breaking forces are considered in special cases of designs of buildings etc.

☆ Types of loads on different Structure

In construction of a building two major ~~new~~ factors are considered safety and economy. If the load are at adjudged and taken higher then economy is effected. If economy is considered and loads are taken lesser then safety is compresed. So the ~~estat~~ estimation of various loads acting is the calculated precisely.

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Indian Standard code IS: 875-1987

American Standard Code ASCE 7: Minimum design load for building and other structures.

→ Types of loads acting on structures are.

① Dead loads
② Imposed load
③ Wind load.
④ Snow loads.
⑤ Earthquake loads.
⑥ Special loads.

① Dead load: The first vertical load is considered dead load. Dead load refers to loads that relatively don't change over time.

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- All permanent components of a building including walls, Beams, Columns. flooring material etc.

Imposed load :- The second vertical load that is considered in design of structure is called imposed load or live loads. are either movable or moving load without any acceleration or impact.

Wind load :-

Wind loads is primarily horizental load caused the movement of air retain to earth wind load is required to be considered in ar structure design especially when the health of building exceed two times.

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Snow load

Snow load Constitute to be vertical load in the building But these types of loads are considered only in the snowfall places.

$$S = \mu S_0$$

S = Design snow load on plan area.

S_0 = Ground Snow load.

Earthquake load:-

Earthquake force Constitute to both vertical and horizental forces on ~~any~~ building. The total Vibration Caused by the earthquake maybe resolved into three mutually perpendicular directions.

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☆ Other loads

① Foundation movement.

② Elastic ~~effd~~ axial shortening.

③ Soil and fluid pressure.

④ Vibration.

⑤ Structure concentration effect due to point load.

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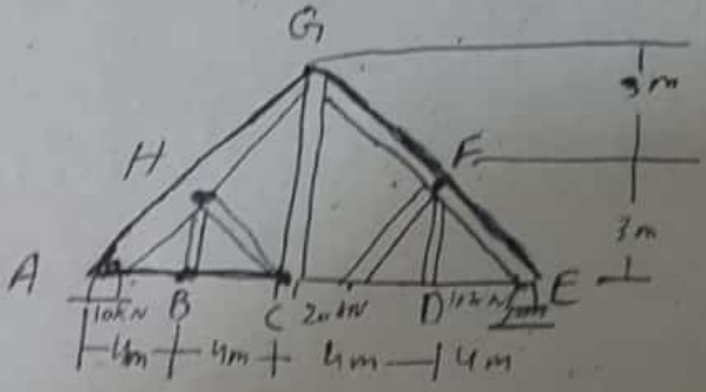
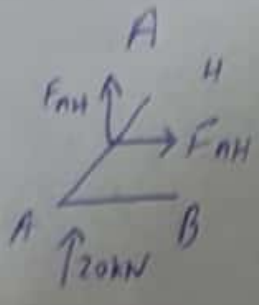
Question # 2

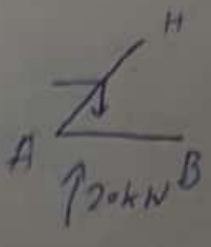
Determine the force in each member of the truss. State if the members are in tension or ~~expresions~~ compression. Assume all members are pin connected.



Ans) Joint A



OR



$\Sigma F_x = 0$

$F_{AB} - F_{AH} \cos\theta = 0$ ... $+\overrightarrow{ve}$ $-\overrightarrow{ve}$

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as for $Q \Rightarrow \tan\theta = \frac{P}{B} = \frac{3}{4}$

or $Q = \tan^{-1}\left(\frac{3}{4}\right) \Rightarrow Q = 36.86°$

$F_{AB} = F_{AH} \cos 36.86 \longrightarrow (a)$

$\Sigma f_y = 0$ ↑ +ive ↓ -ive

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

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

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

or $F_{AB} = 26.68$ kN (T)

Same is for Joint D

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

& $F_{AH} = F_{DE} = 33.34$ kN (C)

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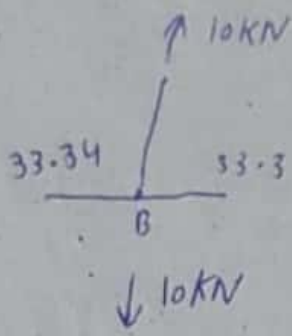
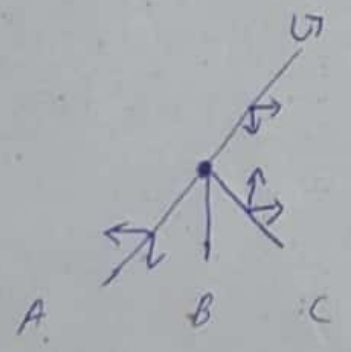
Now Joint B.



As for $F_{BH} = F_{CE} = 10\,kN$ (T)

$F_{BC} = F_{CD} = 33.34\,kN$ (T)

Now Joint H.



$\Sigma fx = 0$ ← -ive → +ive

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

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

$\Sigma fy = 0$ ↑ +ive ↓ -ive

$10 - 33.33 \sin 36.87 - 0.6 F_{HG} + 0.6 F_{HC} = 0 \rightarrow$ (a)

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

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(4)

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

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

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

or $F_{HG} = 8.443$ kN

P.T.V in eq (c)

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

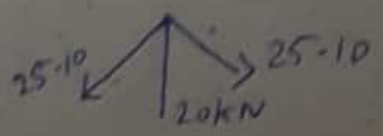
$$-10 - 0.6\,(8.443) + 0.6\,F_{HC} = 0$$

$$F_{HC} = 25.10 \text{ kN} \quad (c)$$

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

& $F_{HG} = F_{GF} = 8.443$ (c)

Now Joint G



$F_{GC} = 20$ kN (T)

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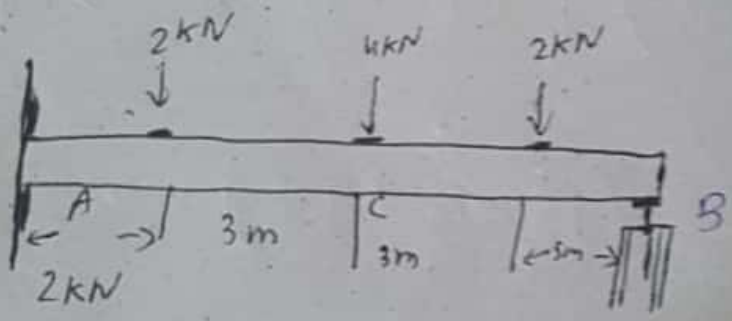
(10)

Question # 3

Determine the slope at A and displacement at C of the beam in the figure by a) Moment Area Theorm and Take $E = 200\ GPa$, $I = 6(10^6)\ mm^4$



Soli:

$E = 200\ GPa$

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

slope (A).

displacement (C)

$$\frac{1}{2}\left(\frac{Pa}{EI}\right)$$

$$Q_{ac} = \frac{1}{2}\left(\frac{Pa}{EI}\right)a + \left(\frac{Pa}{EI}\right)a + \frac{1}{2}\left(\frac{Pa}{2EI}\right)a$$

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$$\theta_{AC} = \frac{1}{2}\left(\frac{P_A}{EI}\right)a + \left(\frac{P_a}{EI}\right) + \frac{1}{2}\left(\frac{P_A}{2EI}\right)a$$

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

$$+\frac{1}{2}\left(\frac{2\times3}{2\times200\times10^9}\right)\times6\times10^{-5}\Big)$$

$$\theta_{ac} = \left(\frac{1}{200\times10^9\times6\times10^{-5}}\right)\left(\left(\frac{3}{2}(4\times3)+(12\times3)+\frac{3}{2}\left(\frac{1}{2}\right)\right)^3\right.$$

$$\theta_{ac} = \frac{1}{200\times10^9}(18+36+4.5)$$

$$\theta_{ac} = 0.00002925\,m$$

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

$$\left[a+\frac{1}{2}a\right] + \left[\frac{1}{2}\left(\frac{P_A}{2EI}\right)a\right]\left[a+\frac{2}{3}a\right]$$

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(12)

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

$$t_{BC} = 9 \times 10^{-6} + 8.1 \times 10.5 + 1.125 \times 10^{-5}$$

$$t_{BC} = 1.0125 \times 10^{-4} \text{ or } 0.00010125$$

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