MID TERM EXAM

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SECTION	B
DEPT	BE(C)
SUBJECT	STRUCTURAL ANALYSIS
SEMESTER	4th
SUBMITTED TO	Engr. Amjid Islam
DATE	18-April-2020

QUESTION # 01

Write a detail note in your own words on different types of loads that different types of structure are designed to support throughout its life. Elaborate with examples?

ANSWERS :~

LOADS :~

A weight or source of Pressure exerted by some-one or something.

OR

A load imposed on a completed or incomplete structures during as a result of the ~~tom~~ construction process.

DIFFERENT TYPES OF LOAD :~

There are different types of loads which are as follow.

1. Dead load
2. Live load
3. Wind load
4. Snow load
5. Sesmic load

i) DEAD LOAD :~

It is the permanant load which is consist of structural members.

For Example :-

It includes the weight of columns, beams weight of walls, floors and roofs etc

ii) LIVE LOAD :~

line load is a temporary load which is consist of other then structural members.

FOR EaAMPLE :~

It includes furniture, peoples refrigerators etc

iii) WIND LOAD :~

Wind load is a type of load which acts horizontally on the walls, roofs and inclined roof of the structure. The wind load is depending on several factors such as location of structure, height of the structure duration of wind flow etc.

iv) SNOW LOAD :~

Snow load is a type of load which is exerted by snow vertically downward on the structure. It depends upon shape and size of roof, roofing Material, duration and frequency of snow.

V) SEISMIC LOAD

Seismic load is a type of natural load. These loads are internal forces which acts on the structure due to earthquake developed ground moments.

TYPES OF STRUCTURE :-

There are different types of structure that are designed to support all the types of load.

i) FRAME STRUCTURE
ii) TRUSSES
iii) CABLE AND ARCHES :-

i) FRAME STRUCTURES :-

This types of structures are used in buildings that consist of beams and coloumns. Which are fixed with each other. In frame structures the load is directly transfered through beam and column to the foundation. This load can either be dead or live or both.

FOR EXAMPLE :~

The best example of frame structure is Eiffel Tower which is located in Paris, France. All the joints are exerting load on beam, columns and then ground.

ii) TRUSSES :~

Trusses consist of slender elements in triangular form. Truss structure are made where longer span is required. Due to arrangement of its member bends are converted into tensile or compressive forces in members.

EXAMPLE :~

The example's is Bethanga Bridge located on the Murray River in Australia.

iii) CABLES AND ARCHES :~

It is the type of structure used to span long distances.

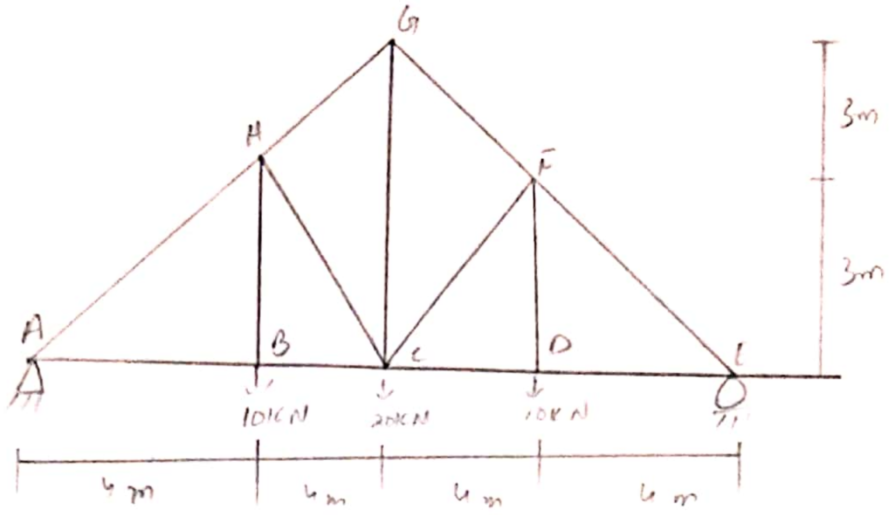
-> Cables are flexible and carry load in tension. They are commonly used to support bridges.

-> Arches strength in compression and has connected to cables. It must be rigid to maintain its shape

EXAMPLE :-

The example of cable and arches structure is George Washington bridge in Newyork America.

QUESTION # 02



Sol

REACTIONS :~

$\Sigma F_y = 0 \quad \overset{+}{\uparrow} \downarrow -$

$R_A + R_E = 40 \quad —(i)$

$\Sigma M_A = 0 \quad \circlearrowright -ive$

$R_E(16) + 10(12) + 20(8) + 10(4) = 0$

$R_E = 320/16 = 20KN$

$R_A = 40 - 20$

$\boxed{R_A = 20KN}$

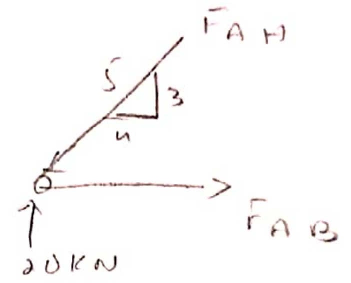
Now determining force in each member.

A :

$\Sigma F_y = 0 \; ; \; -3/5(F_{AH}) + 20KN = 0$

$= -0.6(F_{AH}) = -20KN$

$\boxed{F_{AH} = 33.33\ KN(C)}$



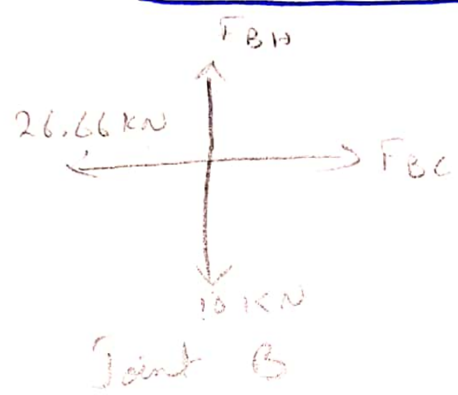
$\Sigma f_x = 0 \; ; \; -\frac{4}{5}(33.33) + F_{AB} = 0$

$\Rightarrow$ **$F_{AB} = 26.66$ KN (T)**

B :

$\Sigma f_x = 0 \; ;$ **$F_{BC} = 26.66$ KN (T)**

$\Sigma f_y = 0 \; ;$ **$F_{BH} = 10$ KN (T)**



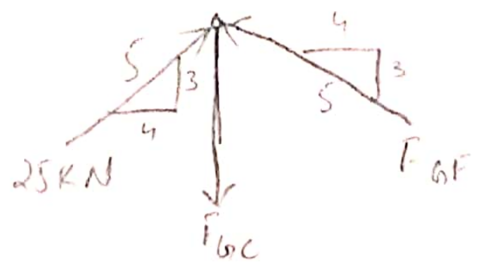
G :

$\Sigma f_x = 0 \; ; \; \frac{4}{5}(25) - \frac{4}{5}(F_{GF}) = 0$

$F_{GF} = 25$ KN (C)

$\Sigma f_y = 0 \; ; \; \frac{3}{5}(25) + \frac{3}{5}(25) - F_{GC} = 0$

$F_{GC} = 30$ KN (C)



H :

$\Sigma f_y = 0$; $3/5(33.33) - 10KN + 3/5(F_{HC}) - 3/5(F_{HG})$ —(ii)

$\Sigma f(x) = 0$; $4/5(33.33KN) - 4/5(F_{HC}) - 4/5(F_{HG})$ —(iii)

Solving eq (ii) and eq (iii)

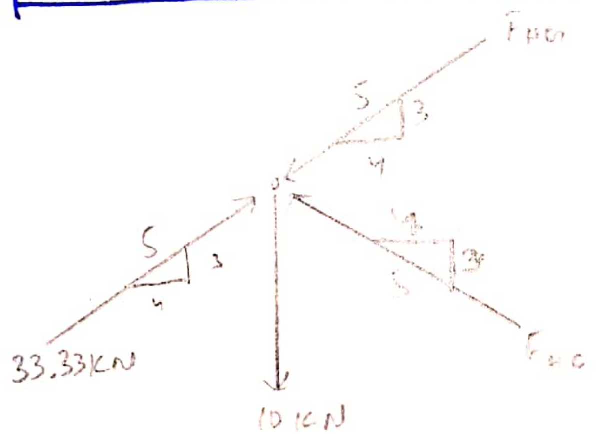
$19.98 - 10 + 0.6F_{HC} - 0.6F_{HG} = 0$ — ii

$26.66 - 0.8F_{HC} - 0.8F_{HG} = 0$ —(iii)

Multiplying eq A by 1.34 and then add with eq (B) we get

$F_{HG} = 25KN (C)$

$F_{HC} = 8.34 KN (C)$



Due to semetrical loading & Geometry.

$F_{AB} = F_{ED} = 26.66 KN (T)$

$F_{BC} = F_{DC} = 26.66 KN (T)$

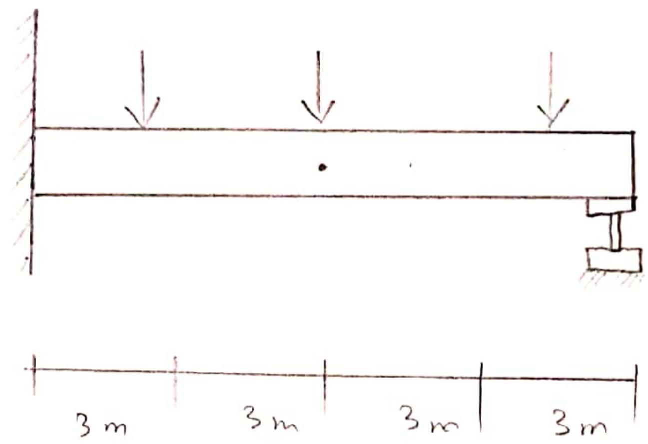
$F_{BH} = F_{DF} = 10 KN (T)$

$F_{HG} = F_{FG} = 25 KN (C)$

$F_{HC} = F_{FC} = 8.34 KN (C)$

$F_{AH} = F_{EF} = 33.33 KN (C)$

QUESTION # 03

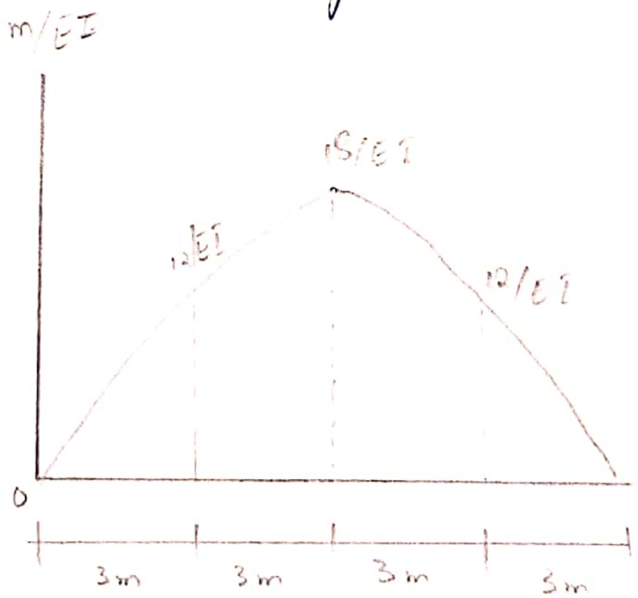


Where $E = 200\,GPa$, $I = 6 \times 10^6\,mm$

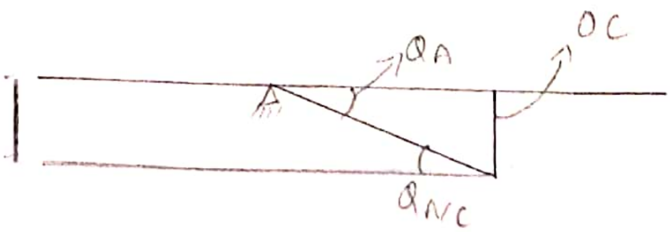
Determine the slope at point A and displacement at 'C' using Moment Area Theorem.

Sol

Moment Diagram :-



ELASTIC CURVE :-



$$\theta_{A/C} = \frac{1}{2}\left(\frac{12}{EI}\right)(3) + \left(\frac{12}{EI}\right)(3) + \frac{1}{2}\left(\frac{6}{EI}\right)(3)$$

$$\theta_{A/C} = \frac{18}{EI} + \frac{36}{EI} + \frac{9}{EI}$$

$$\theta_{A/C} = 63/EI$$

$$\theta_{AC} = \frac{63}{(200\times10^6)(6\times10^4)(1000)^{-4}}$$

$$\theta_{A/C} = 0.0525 \text{ rad}$$

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

$$t_{A/C} = \left[\frac{1}{2}\left(\frac{12}{EI}\right)(3)\right]\left[\left(\frac{2}{3}\right)(3)\right] + \left[\left(\frac{12}{EI}\right)(3)\right]\left[3 + \frac{1}{2}(3)\right]$$
$$+ \left[\frac{1}{2}\left(\frac{6}{EI}\right)(3)\right]\left[3 + \left(\frac{2}{3}\right)(3)\right]$$

$$t_{A/C} = 0.202 \text{ m}$$

Hence

$$\boxed{\Delta_C = t_{A/C} = 0.202 \text{ m} = 202 \text{ mm}}$$ ANS