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SECTION : "A"

SEMESTER: 4th

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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.

Answer:-

Loads:

Loads are those forces for which a structure should be proportioned. Load that act on structure can divided into the following categories.

* Dead loads
* live loads.

"OR"

It is diamensional requirement for a structure nessorry to determine the loads the structure must support.

Types of loads:

There are different types of loads which are:

* DEAD LOADS.
* LIVE LOADS.

DEAD LOADS:

It consist of structural members that are permanently attached to structure Dead load includes the weight of columns, beams girders, electrical feachers and other attachments.

Live loads:-

Live loads are those that may vary in magnitude and may also change in location.

Live loads consist chiefly occupancy loads in buildings and traffic loads in bridges.

Live loads at given time are uncertain both in magnitude and distribution.

Example:-

The live floor loading in classroom consist of disks, chairs and laboratory equipment.

TYPES OF STRUCTURE:

The Combination of structural elements and the material which function as a structural System. Each System consist of one or more of four types of structure.

1) TRUSSES :-

TRUSSES consist of slender elements in triangular form. Due to geometric arrangements of its member bonds are converted into tensile or compressive forces in members.

→ Planar trusses are compressed of member, lies in some plane and used for bridges and roof supports.

2) FRAMES :-

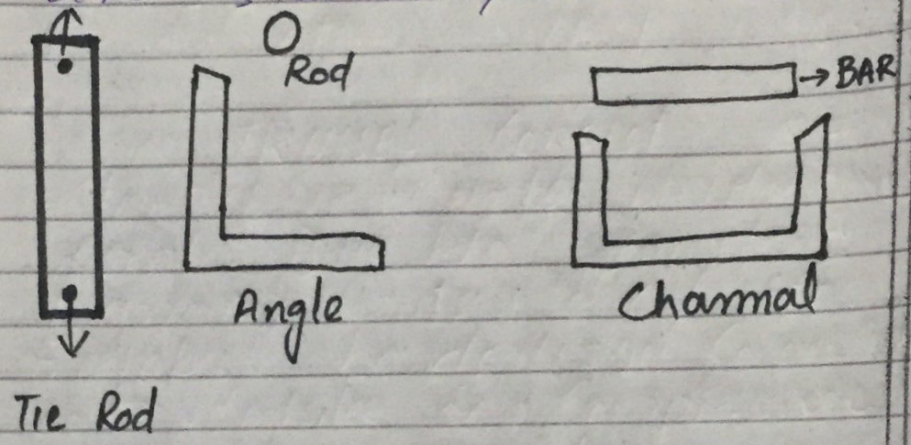
Types of structure which are used in buildings and consists of beams and columns which are fixed or pin connected. The bad frances causes bending of its members and has rigid joint connection. This structure is indeterminate.

Structure elements:-

Some elements are:

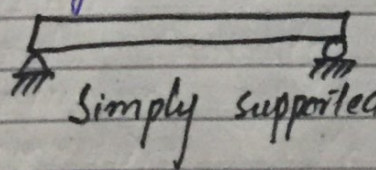
1) TIE RODS:-

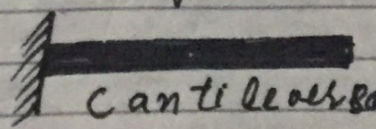
Consist of tensile force. These members are slender, bars or rods.

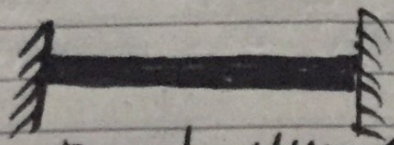


2) BEAMS:

Beam are horizantal member and support vertical loads. It consist bending moments. Short carry large loads.

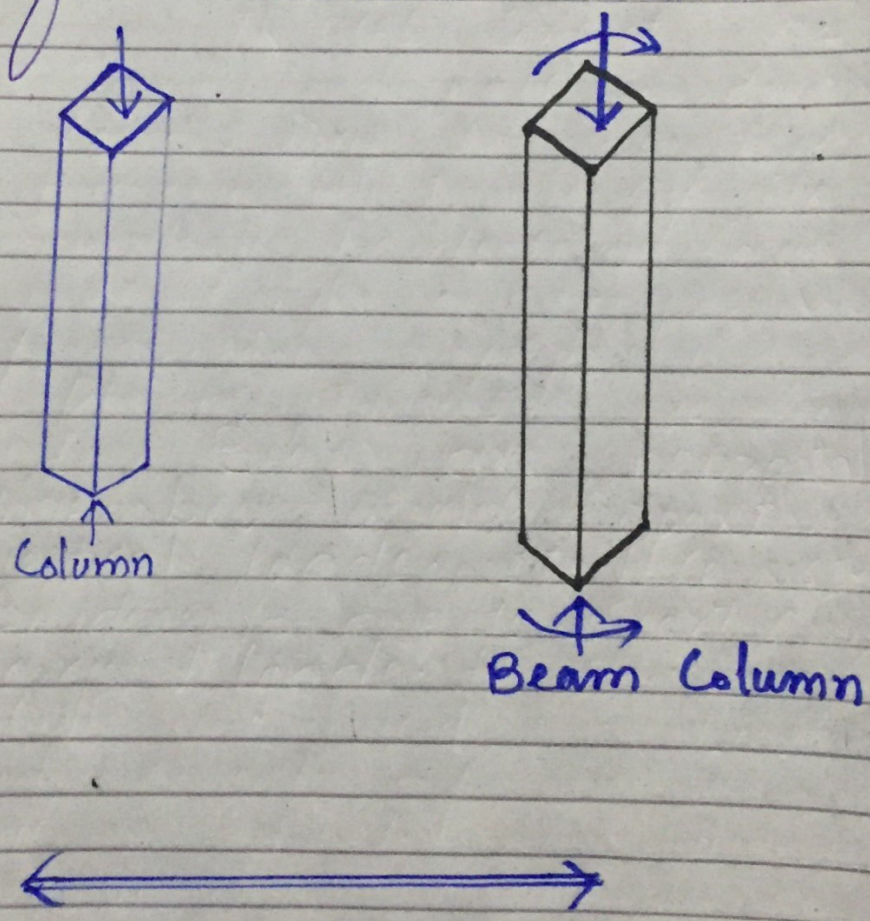




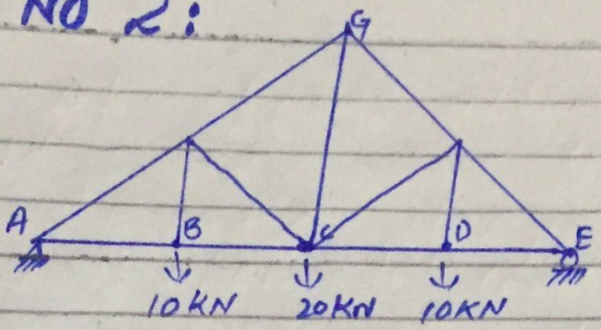


3) Columns:

Columns are consist of vertical members and resist compressive loads Tubes and wide-flange across sections are used for metal columns and square cross section rods and used for concrete work.



Question NO 2:



Forces in each member = ?

Sol: Support reactions:

$\Sigma F_y = 0$ $\quad \uparrow^+ \downarrow^-$

$R_A + R_E = 40$ ——— (A)

$\Sigma M_A = 0$ $\quad \circlearrowleft^-$

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

$R_E = 320/16 = 20\,KN$

Pull $= 40 - 20 \Rightarrow R_A = 20\,KN$

NOW!

Determining force in each member:

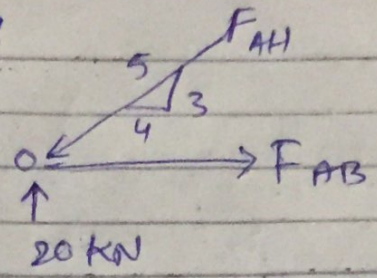
Joint A:

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

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

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

Joint A:



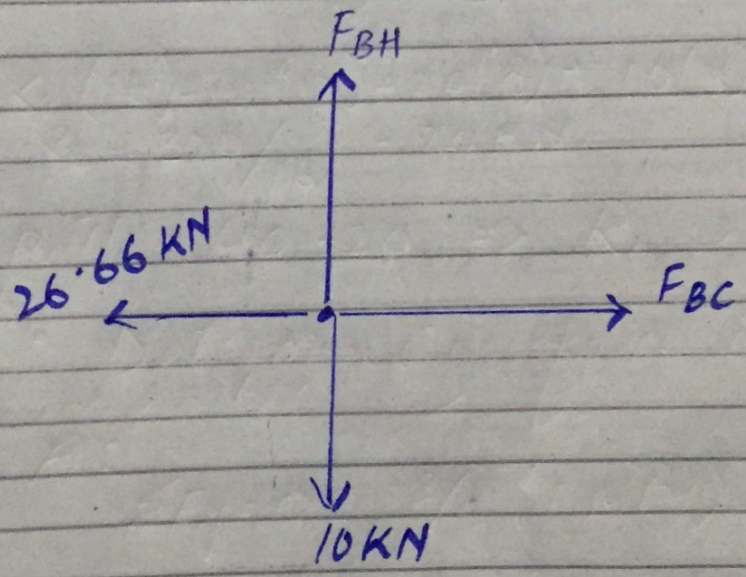
$\Sigma f_x = 0; -4/5\ (33.33) + F_{AB} = 0$

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

Joint B:

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

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



Joint B

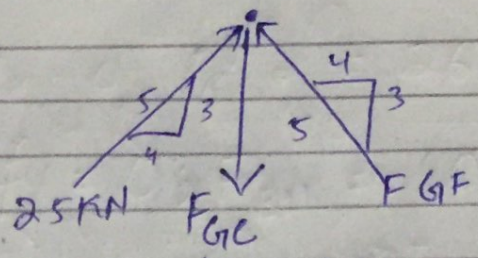
Joint G :-

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

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

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

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



Joint G:

Joint H :-

$\Sigma F_y = 0; \; 3/5(33.33_{KN}) - 10\,KN + 3/5(F_{HC}) - 3/5(F_{HG})$ — (A)

$\Sigma F_x = 0; \; 4/5(33.33_{KN}) - 4/5(F_{HC}) - 4/5(F_{HG})$ — (B)

Solving eq (A) & eq (B)

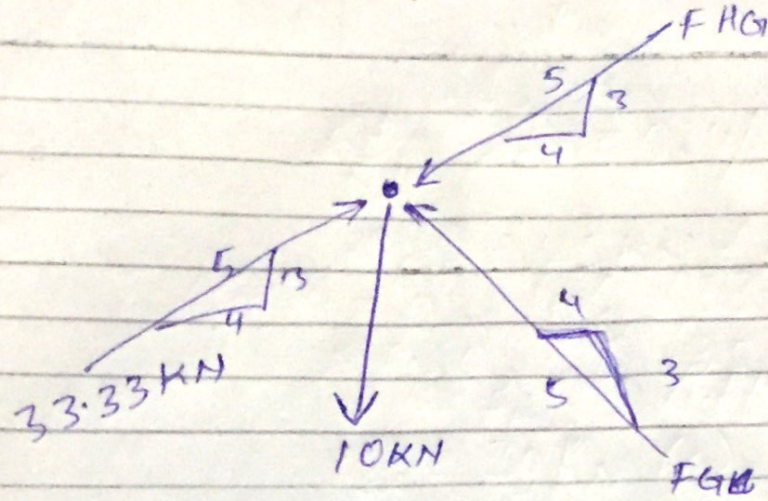
$19.98 - 10 + 0.6F_{HC} - 0.6F_{HG} = 0$ — (A)

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

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

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

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



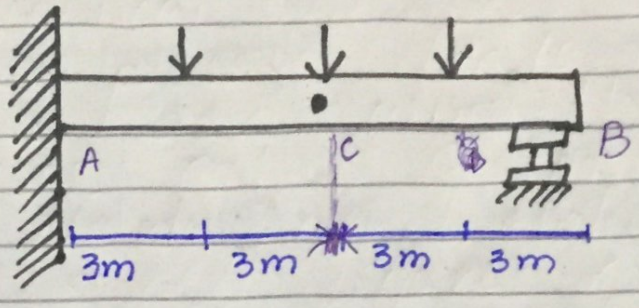
joint H.

Due to Symmetrical loading & Geometry.

$F_{AB} = F_{ED} = 26.66\,KN\,(T)$.
$F_{BC} = F_{DC} = 26.66\,KN\,(T)$.

$F_{BH} = F_{DE} = 10\,KN\,(T)$
$F_{HG} = F_{FG} = 25\,KN\,(C)$
$F_{HC} = F_{FC} = 8.34\,KN\,(C)$.
$F_{AH} = F_{GF} = 33.33\,KN.\,(C)$

Question 3



Given

$E = 200$ Gpa

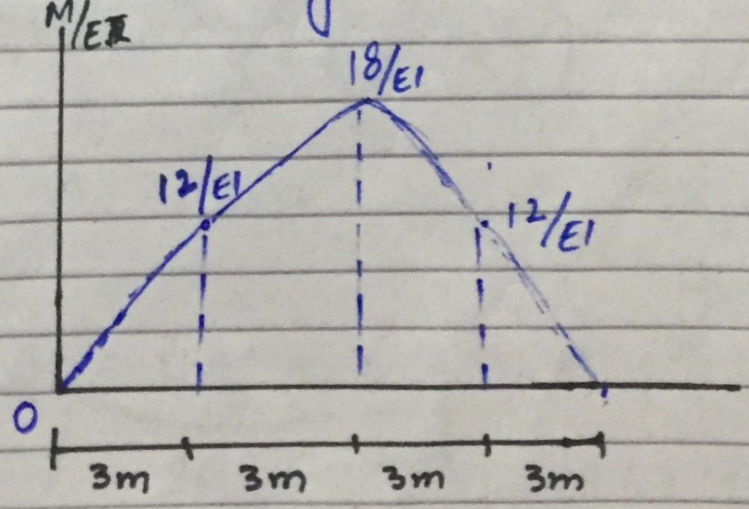
$I = 6 \times 10^6$ mm^4

Determine slope at point "A" and displacement at "C" using Moment area theorm

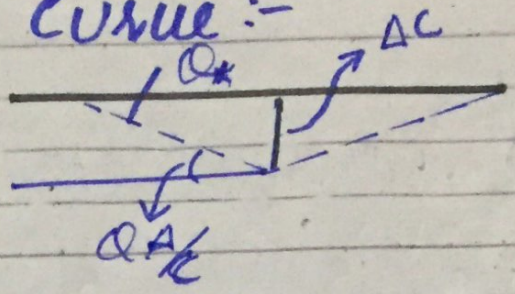
Solution:

(i) Finding out M/EI Diagram and elastic Curved.

- Moment Diagram:



Elastic Curve :-



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

$$\theta_{A/C} = \left(\frac{18}{EI}\right) + \left(\frac{36}{EI}\right) + \left(\frac{9}{EI}\right)$$

$$\theta_{A/C} = \frac{63}{EI} \Rightarrow \frac{63}{(200\times10^{6})(6\times10^{6})(1000)^{-4}}$$

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

$$\theta_{A} = 0.0525 \text{ rad Ans.}$$

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

$$= 0.202 \text{ m}$$

So!

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

$$= 202 \text{ mm} \quad \text{Ans.}$$