①

Q NO 1

Write detail note on your own words on different types of loads that different Types of structure are designed to support throught its life. Elaborate with example:

Loads: It is the dimensional requirement for a structure necessory its determine the loads the structure must support.

Types of loads: There are different Types of loads which are:

① **DEAD loads:** It consist of structural members that are permanently attached to structure. Dead load includ

The weight of colums, beams, girders, electrical fixtures and other attachments.

2) **Live loads:** Live loads can very both in their magnitude and location. These loads are caused by weights of temporarily objects, moving vehicals, natural forces. Consist of additional protection against excess deflection and over load.

Examples: The live floor loading in classroom consists of desks, chairs and laboratory equipment.

③

Types of Structures :- The Combination of Structural elements and the matiral which functions as a structural system. Each System consists of one or more of four Types of Structures.

Different Types of Structures are:-

① TRUSSES :- Trusses Consists of Slender ~~elem~~ elements in Triangular form. Due to geometric arrangments of its members bonds are converted into tensile or Compressive forces in members.

→ planner Trusses are Composed of members, lies in Same plane and used for bridges and Roof Supports.

→ Space Trusses have members extending in three diemensions and used for discuss and Truss.

2) Cables & Arches :-

it is the Type of Structure used to Span long distances.

→ Cables are flexiable and essy loads in tension.

They are Commonly used to Support bridges, roofs.

→ Arches achieves Strength in compression and has a reverse Curvature is cable. It must be rigid to maintain its Shape.

Consist of Chear and moment.
They are used in bridge Strucher.
dome Roofs and openings.

3) **FRAMS:** Type of Strucher which are used in buildings and consist of beam and Coulmn. which are fixed or pined conected.
The bed on frames causes binding of its members and has rigid joint conections.

This Struchers is indeterminate.

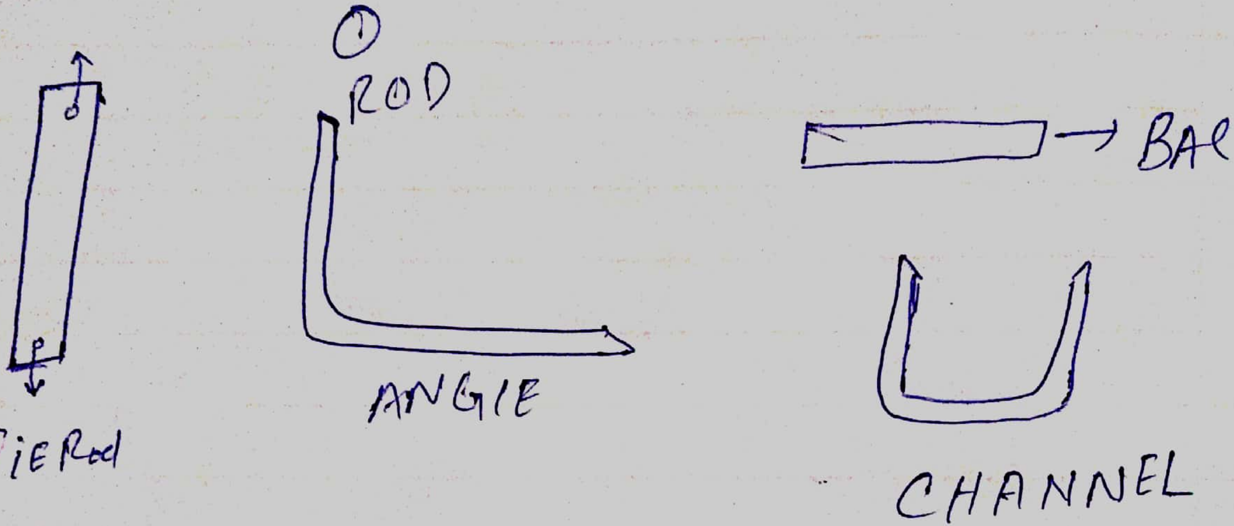
→ **Strucher Elements:**

Some of elements are.

P.T.O

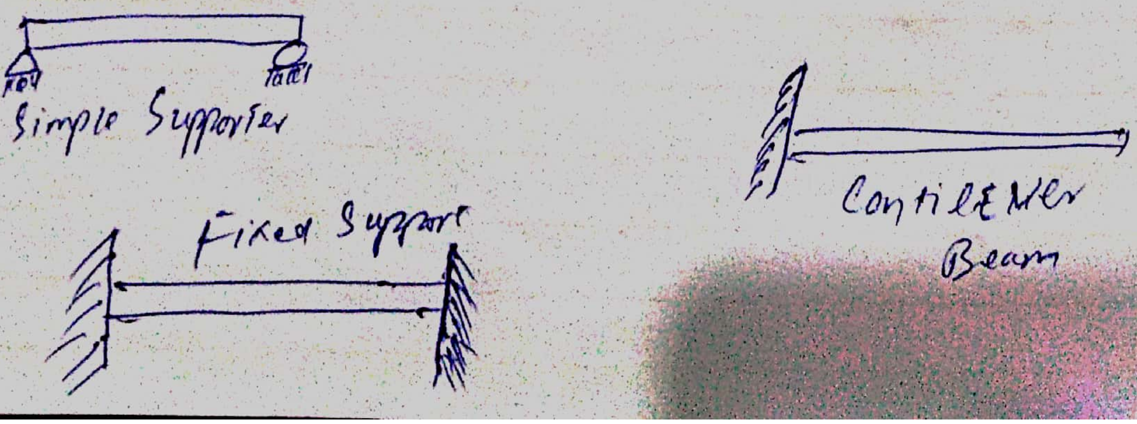
① Tie Rods:

Consist of Tensile force. these members are under bars or rods.



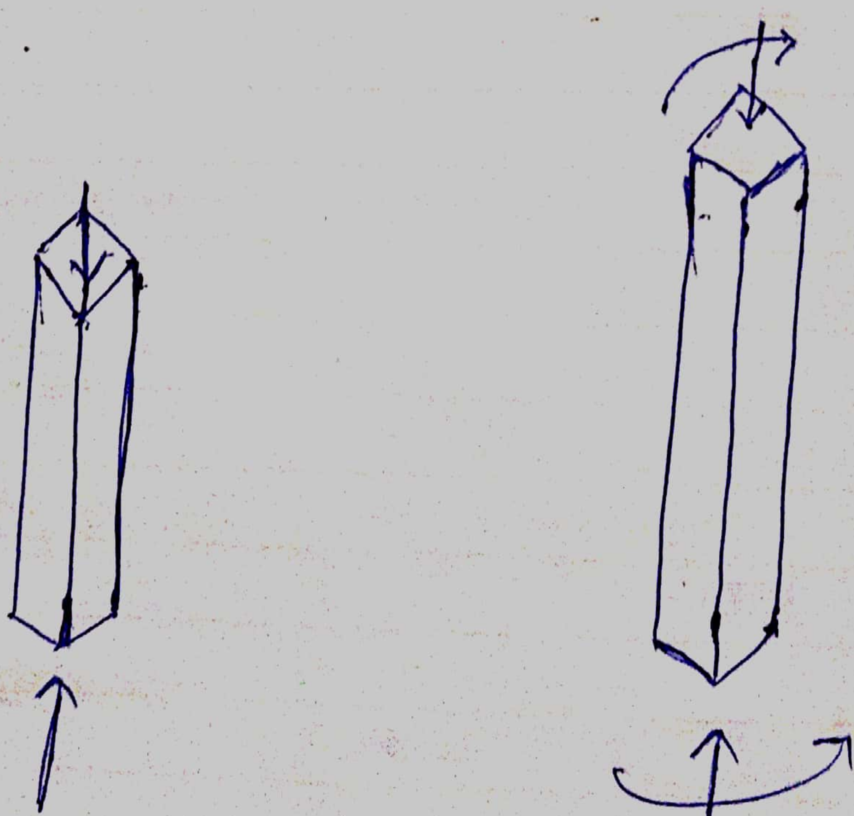
2) BEAMS;

They are horizontal members and supports vertical loads it Consists bending moments short ess of large loads.



(3) Colum^n's :- They consist of vertica members and resists compressive loads.

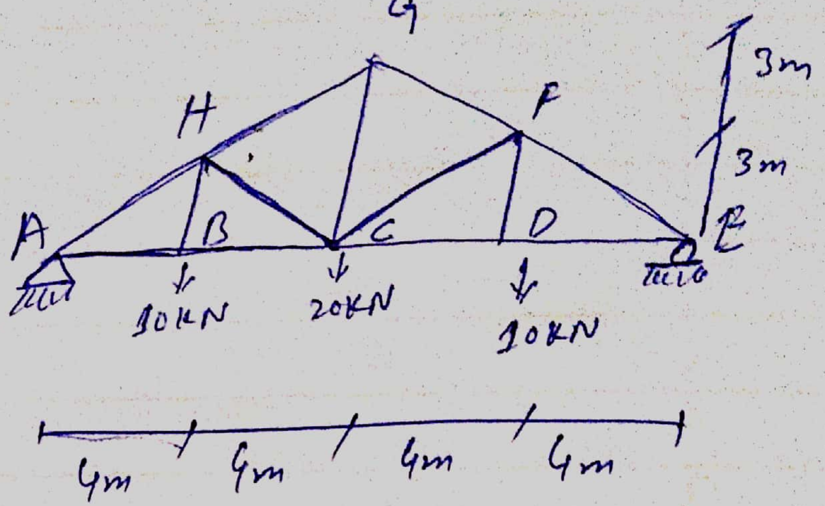
Tubes & wide-flange across sections are used for metal columns & square cross sections rods are used for concrete work.



Column

BEAM-Column

Q NO2 :



Forces in each members?

Sols:-

Support reactions:

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

$R_A + R_B = 40 \longrightarrow (A)$

$\Sigma M_A = 0$ $\circlearrowleft^{-}$

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

$R_E = 320/16 = 20 KN$

$R_{ut} = 40 - 20 \Rightarrow R_A = 20\,kN$

Now determing force in each members.

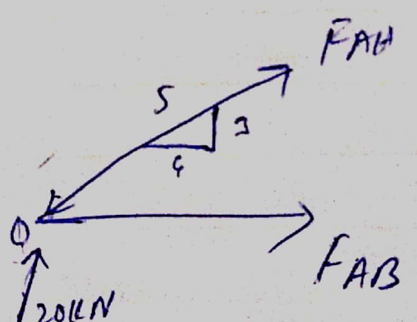
Joint A :

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

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

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

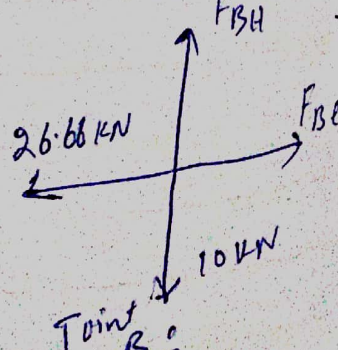
Joint A :



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

$= F_{AB} = 26.16\,kN\,(T)$

$\Sigma F_y = 0; \quad F_{BH} = 10\,kN\,(T)$



Joint B :

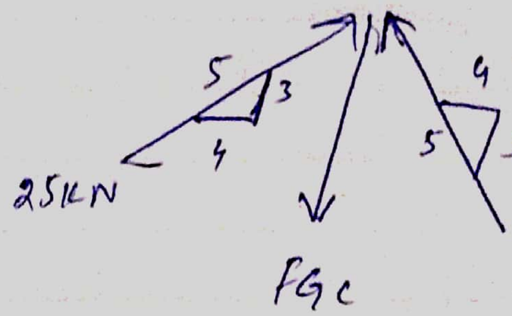
Joint G:

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

$F_{GF} = 25\ kN\ (C)$

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

$F_{GC} = 30\ kN\ (C)$



Joint G:

Joint H:

$\sum F_y = 0;\ \frac{3}{5}(33.33) - 10kN + \frac{3}{5}(F_{HC}) - \frac{3}{5}(F_{HG}) \rightarrow (A)$

$\sum F_x = 0;\ \frac{4}{5}(33.33\ kN) - \frac{4}{5}(F_{HC}) - \frac{4}{5}(F_{HG}) \rightarrow (B)$

Solving eq ① & eq ②

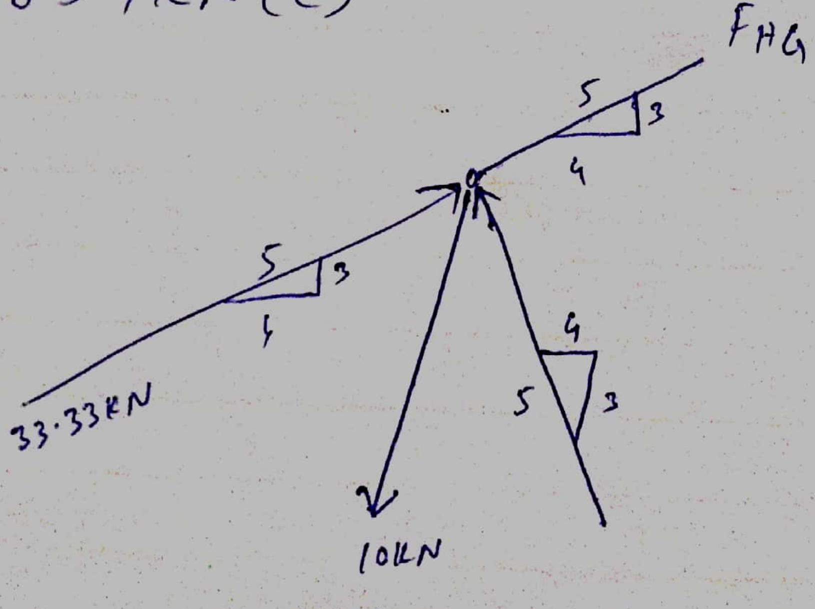
$19.98 - 10 + 0.6\ F_{HC} - 0.6\ F_{HG} = 0 \longrightarrow$ Ⓐ

$26.66 - 0.8\ F_{HC} - 0.8\ F_{HG} = 0 \longrightarrow$ Ⓑ

Multiplying eq Ⓐ by 1.34 & Then add with eq Ⓑ we get:

$F_{HG} = 25\ kN\ (C)$

$F_{HC} = 8.34\ kN\ (C)$



Joint H :

(12)

Due to Symmetirical loading & Geometry.

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

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

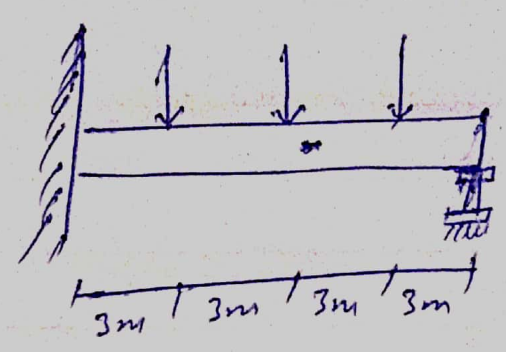
$F_{BH} = F_{DF} = 10$ kN (T)

$F_{HG} = F_{FG} = 2.5$ kN (C)

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

$F_{AH} = F_{CF} = 33.33$ kN (C)

Q NO3



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

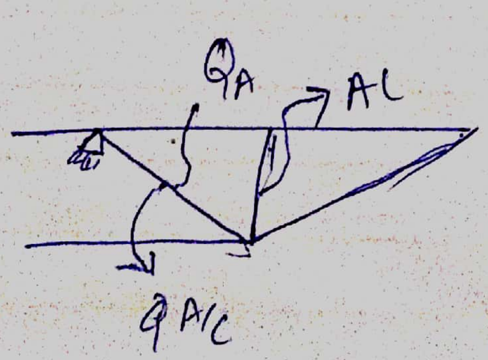
Determine Slope at point 'A' & Displacment at 'C' using Moment Area theorm.

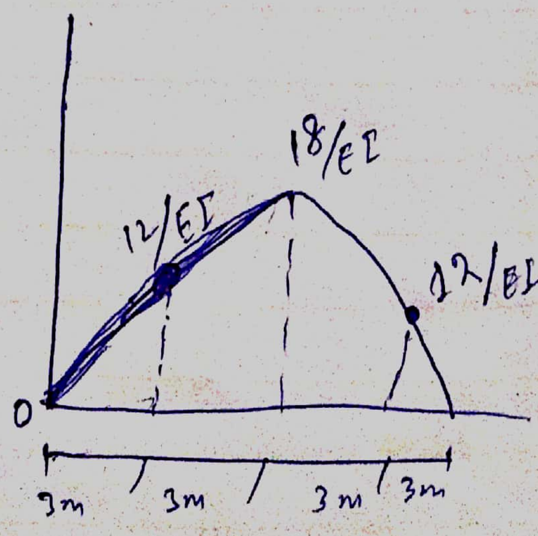
Solution :

(i) Finding out M/EI Diagram & elastic curve.

Moment Diagram

Elastic Curve :





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

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

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

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

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

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

$$= 0.202 \text{ m}$$

So

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

$$= 202 \text{ mm}$$

Ans

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