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Section : B

Subject : Steel Structure

Department : BE (C)

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Q1:. Write detail note on your own words on different types of loads that different types of structure are designed to support throughout its life. Elaborate with examples.

Ans:- Load: It is the dimensional requirement for a structure necessary to determine the load the structure must support.

① Dead Load: It consist of structural members that are permenently attached to structure Dead load include the weight of columns, beams, electrical texture and other attachments.

Line Load:- Line load can vary both in their magnitude and location. these loads are caused

by weight of temporary objects, moving vehicle, natural forces, consist of additional protection against access deflection and overload.

Example:-

The ince floor loading in classroom consists of chairs and laboratory equipment.

Types of Structure:-

The combination of structural elements and the material which functions as a structural system. Each system consists of one or more of four types of structure.

Different types of structures are:-

① Trusses:-

Trusses consist of elements in triangular form. Due to geometric arrangements of its members bend are converted into tensile or compressive force in member.

→ Planar Trusses are composed of members, line in same plane and used for bridges and roof support dimensions are used for Bridges.

→ Space Trusses have members extending in these dimension are used for domics Trusses.

(2) Cables & Accus:-

It is the types of structure used to span long distance.

→ Cables and Fexible and carry load in tensions they are commonly used to support bridges roofs.

→ Accuss achieve strength in compression and has a recess curvature to cable. It must be rigid to maintain its shape consists of shear and moment they are used in bridges structure dome roofs and openings.

(3) Frames:-

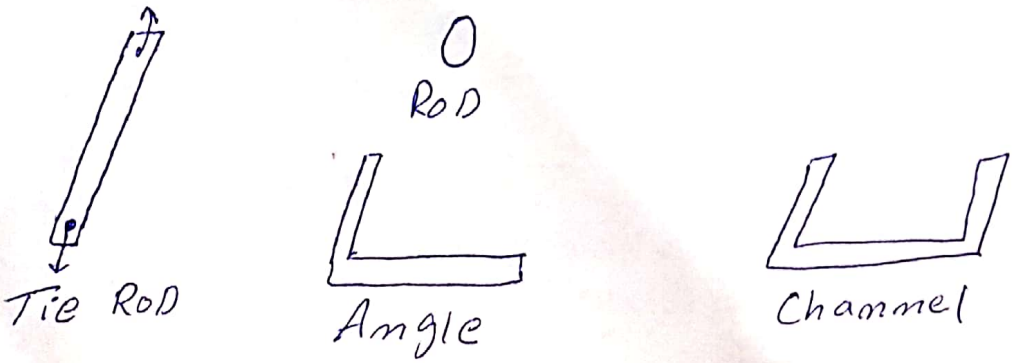
Types of structure which are used in buildings and consists of beam and column which are fixed or Pin connected. The bad on frames causes buildings of its members and has rigid joint connections. This structure is intermediate.

Structure Elements:-

Some of elements are.

(1) Tie Rods:-

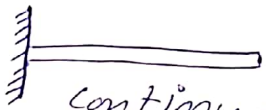
consist of tensile force these members are under bars or rods.



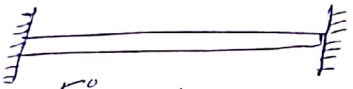
(2) Beams:-

They are horizontal members and support vertical load. It consist bending moment short easy large loads.

Simply support



continued beam

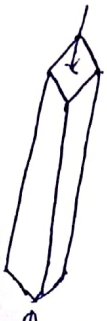


Fixed support

Colums:-

They consist of vertical members and compressive load.

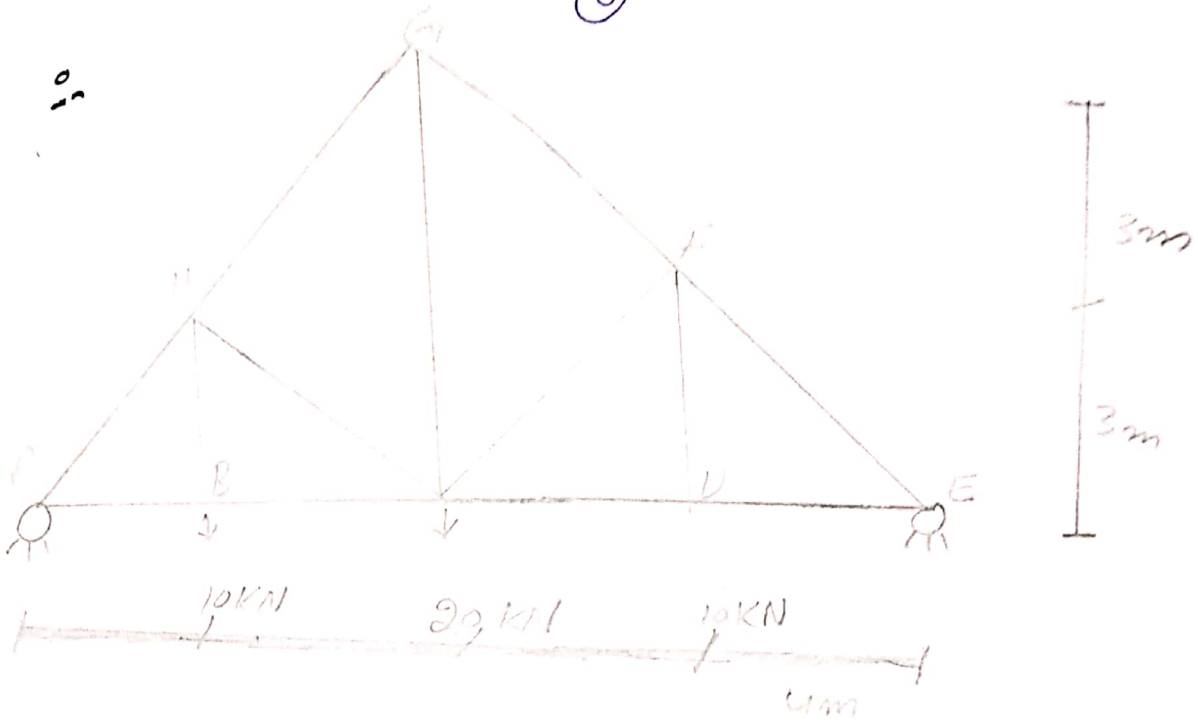
Tubes and wide flange across section are used for metal column and square cross sections rods are used for concrete work



column

Beam-column

Q2 :-



forces in each member = ?

Sol:

Support reactions :-

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

$$R_A + R_E = 40 \quad \text{— (C)}$$

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

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

$$Put = 40 - 20 \Rightarrow R_A = 20\ KN$$

Now determining force in each members.

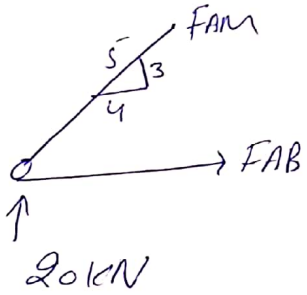
Joint A :-

$$\Sigma F_y = 0 \; ; \; -\tfrac{3}{5}(F_{AM}) + 20\,KN = 0$$

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

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

Joint A :-



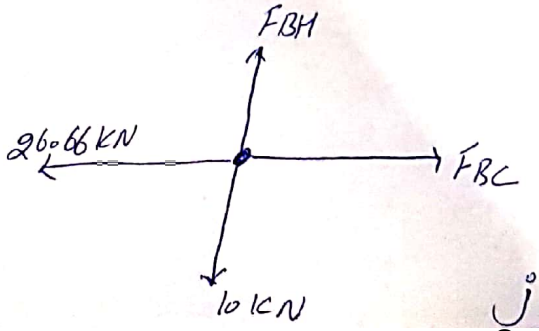
$$\Sigma F_x = 0 \; ; \; -\tfrac{4}{5}(33.33) + F_{AB} = 0$$

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

Joint B :-

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

$$\Sigma F_y = 0 \; ; \; F_{BM} = 10\,KN\,(T)$$



Joint B :-

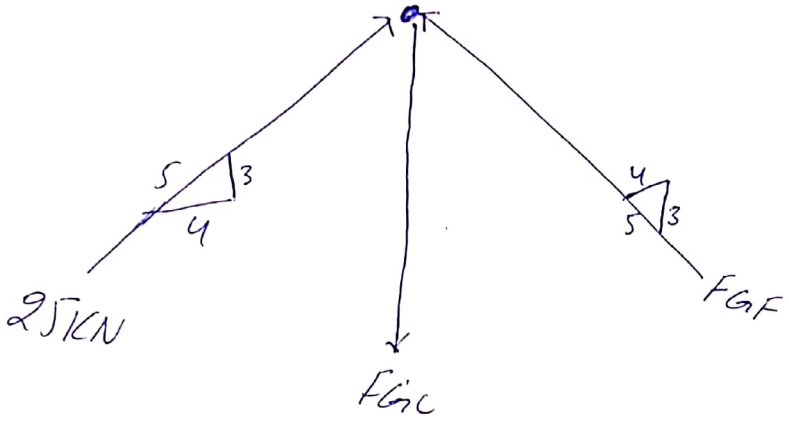
Joint G:-

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

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

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

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



Joint G:-

Joint H:-

$\Sigma F_y = 0;\ 3/5\,(33.33) - 10KN + 3/5\,(F_{HC}) - 3/5\,(A_{HG})$ ④

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

Solving eq ① & ②

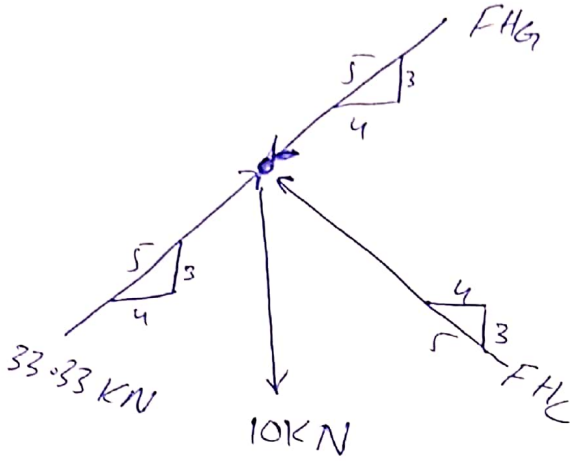
$19.98 - 10 + 0.6\,F_{HC} - 0.6\,F_{HG} = 0 \rightarrow$ (A)

$26.66 - 0.8\,F_{HC} - 0.8\,F_{HG} = 0 \rightarrow$ (B)

Multiply eq A by 1.34 and then add with eq B we get

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

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



Due to symmetrical loading and geometry.

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

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

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

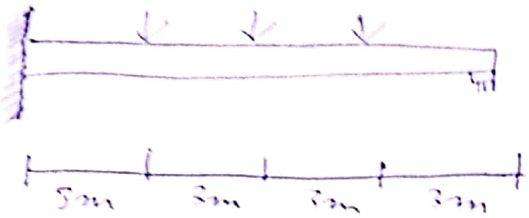
$F_{HG} = F_{FG} = 25\,KN\ (T)$

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

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

(10)

Q3 :-



Given Data :-

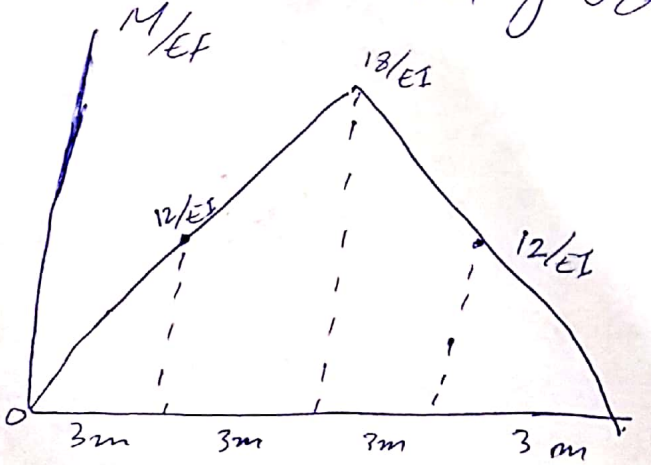
$E = 200 GPa$

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

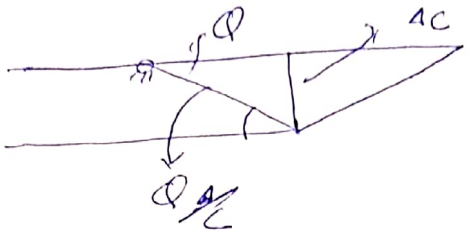
Determine slope at Point P and displacement at 'C, using moment Area theorem.

(i) Finding out M/EI Diagram of electric cause

Moment Diagram



Elastic cause:



$$Q_{\Delta/C} = \frac{1}{2}\left(\frac{R}{EI}\right)(3) + \left(\frac{R}{EI}\right)(3) + \frac{1}{2}\left(\frac{6}{EI}\right)(3)$$

$$Q_{\Delta/C} = \frac{18}{EI} + \frac{36}{EI} + \frac{9}{EI}$$

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

$$Q_{\Delta/C} = 0.05250\,d.$$

$$Q_{\Delta} = 0.05250\,d$$

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

$$= 0.202\,m$$

So

$$\Delta C = t_{\Delta/C} = 0.202\,m$$

$$= 202 \text{ Ans}$$