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Section :- "A"

Submited To ⇒ Amjad Islam

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Subject :- Structural Analysis

Question No. 1 :-

Write detail note on your words on different types of loads that different types of structure age designed to support throughout its life Elaborate with example :-

Answer :-

Loads :-

It is the dimensionall requirement for a structure neeessory to determine the loads the structure most support.

Types of Loads :-

There are different types of loads which are.

Dead Loads :-

It consist of structural members

that are permenantly attached to structure Dead load includes the weight of columns, beams, girders, electrical fixtures and other attachement.

Live Loads:-

Live load can vary both in their magnitude and location. These loads are caused by weights of temperorily objects, moving vehcles natural forces consist of additional protection against excess deflection and overload.

Example:-

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

Types of Structures :-

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

Different types of structures are :

TRUSSES :-

Trusses consists of slender in triangular form. Due to geometric arrangements of its members binds are converted into inside of are compressive forces in members.

Planar issues are composed of members, lies in same plane and used for bridges and roof support.

→ Space issues have member exlinding in their dimensions and used for durides and towers.

2) Cables And Arches:-

It is the type of structure used for span long distance.

→ Cables are flexible and carry loads in tension. They are commonly used to support bridges, roofs.

→ Arches achieve strength in compression and have revers curvature to cable. It must be rigid to maintain its shape consists of chear and moment. They are used in bridge structures, dome roof and openings.

3) Frames :-

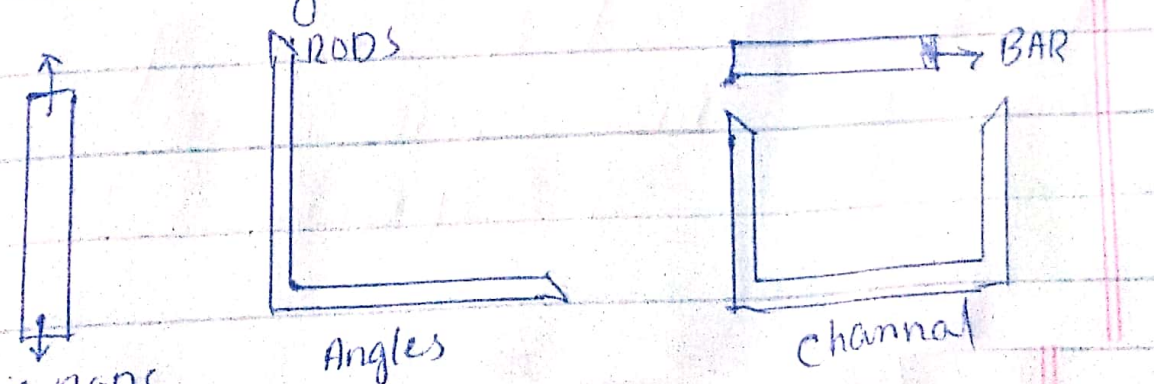
Types of structure which are used in buildings and consist of beams and column, which are fixed or pin connected. The bad on frames causes bindings of its members and has sigid joint connections. This structures is indeterminate.

→ Structural Elements :-

Same elements are:

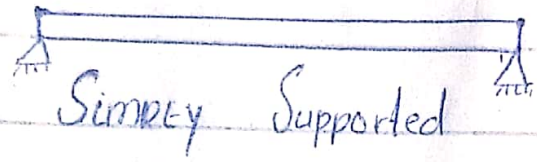
1) Tie Rods :-

Consists of tinside force. These are members are under, bars or rods.

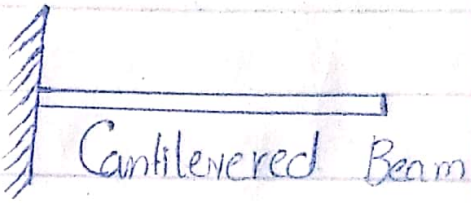


2) Beams :-

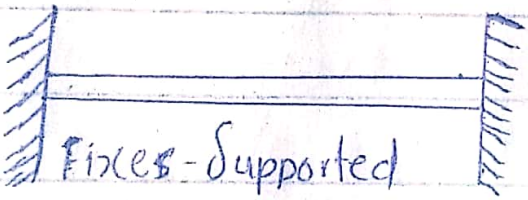
They are horizantal members and support verticle loads. it resists bending moments, short easy large loads



Simply Supported



Cantilevered Beam

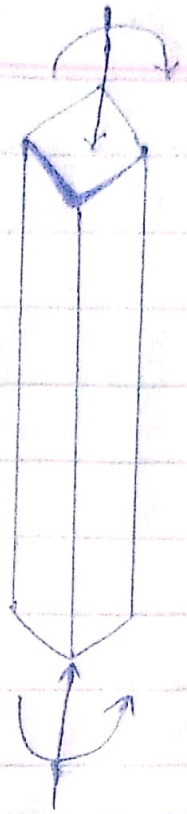


Fixed-Supported

3) Column :-

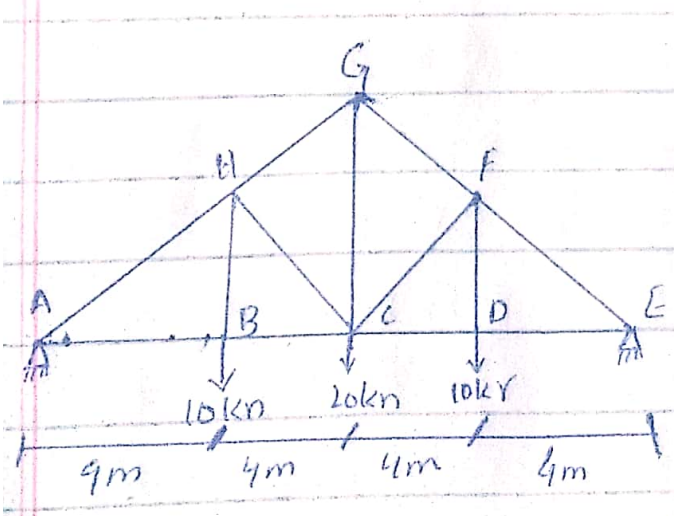
They consists of verticle members and resists compressive loads. Tube and wide-flange across section are used for metal columns. and square cross section rods are used for concrete work.

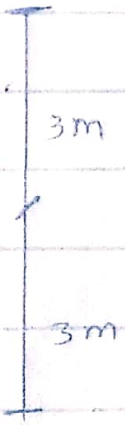
column



Beam-column

Question No. 2





Focus in each member = ?

Soln

Support Reaction:

$\Sigma fy = 0$ ↑ ↓

$R_A + R_E = 40 \longrightarrow (1)$

$\Sigma M_A = 0$ ↻

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

$R_E = 320/16 = 20kN$

$R_A = 40 - 20 \Rightarrow R_A = 20kn$

Now determing force in each member.

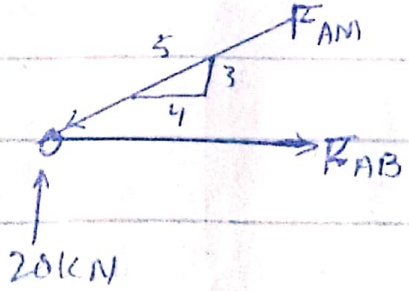
Joint A:

$\Sigma fy = 0$; $-3/5\ (F_{AM}) + 20kn = 0$

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

F_{AM} 33.33 kN (C)

Joint A :



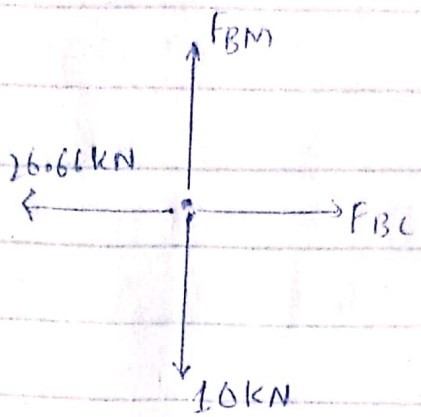
$\Sigma fx = 0$; $-4/5\ (33.33) + F_{AB} = 0$

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

Joint B :

$\Sigma fx = 0$; $F_{BC} = 26.66\ kN(T)$

$\Sigma f_y = 0$; $F_{BM} = 10kN\ (T)$



~~Joint B :-~~

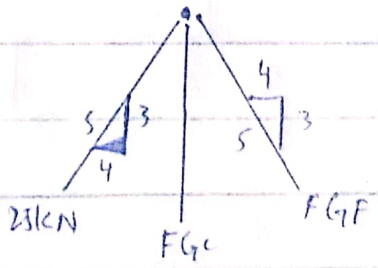
Joint G :-

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

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

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

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



Joint G :

Joint H :-

$\Sigma f_y = 0$; $3/5\ (33.33) - 10kN + 3/5\ (F_{HC}) - 3/5\ (F_{HG})$ → (a)

$\Sigma f_x = 0$; $4/5 (33.33kN) - 4/5\ (F_{HC}) - 4/5\ (F_{HG})$ → (B)

Solving eq (1) & eq (2)

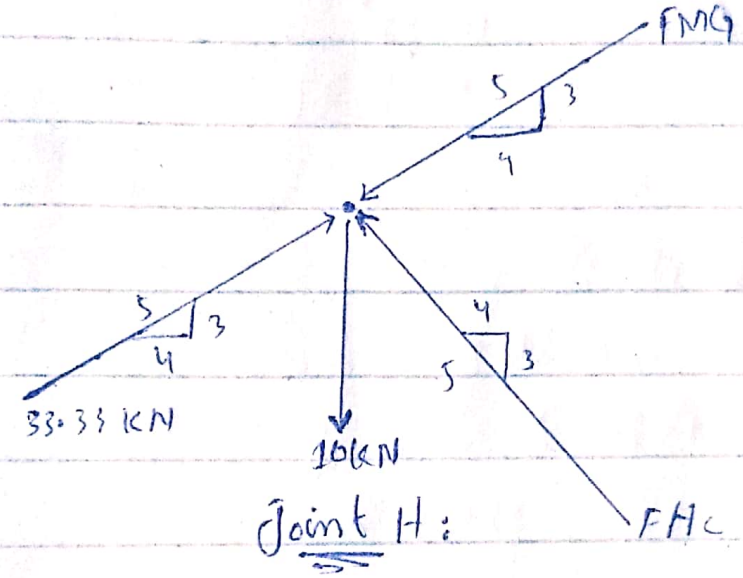
$19.98 - 10 + 0.6 F_{MC} - 0.6 F_{MG} = 0$ ——— (A)

$26.66 - 0.8 F_{MC} - 0.8 F_{MG} = 0$ ——— (B)

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

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

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



Joint H:

Due to symmetrical loading & Geometry.

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

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

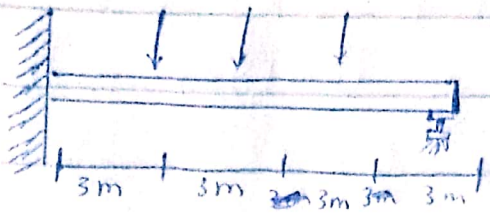
$F_{BM} = F_{DF} = 10 KN (T)$.

$F_{MG} = F_{FG} = 25 KN (C)$.

$F_{MC} = F_{FC} = 8.34 KN (C)$.

$F_{AM} = F_{EF} = 33.33 KN (C)$.

Question #3 :-



Given :-

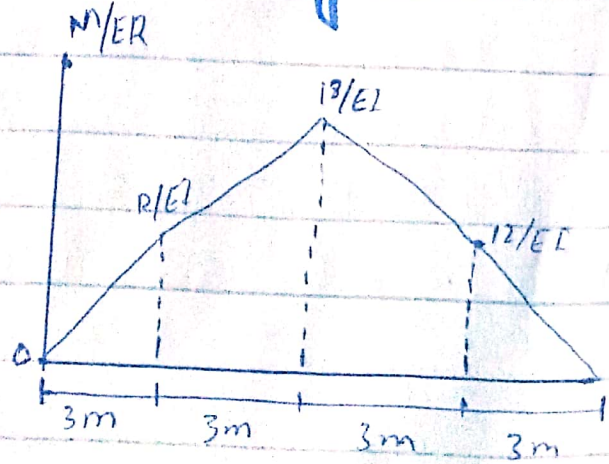
$E = 200$ Gpa , $I = 6 \times 10^6$ mm.

Determine slope at point "E" and displacement at "C" using moment area theorem.

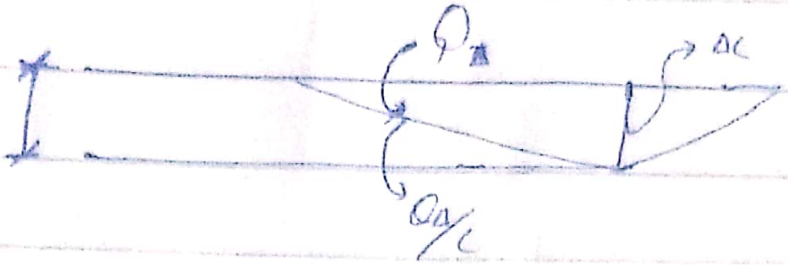
Solution :-

(i) Finding out PMV/EI Diagram of Elastic curve.

Moment Diagram :-



Elastic Curve :-



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

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

$\theta_{A/C} = \left(\frac{63}{EI}\right) \Rightarrow \frac{63}{(200\times10^6)(6\times10^6)(100)^{-4}}$

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

$\theta_A = 0.0525$ rad Ans:

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

$= 0.202$ m

So

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

$= 202$ m

Ans