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Section A

Subject Structure Analysis

Semister 4th

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Student Signature

Question No 1

Answer

LOADS:

It is the dimensional requirements for the structure necessary to determine the loads the the structure must support.

Types of Loads:

There are different types of loads with are

1) DEAD LOADS:

It consist of structure members that are Permanantly attached to structure. Dead load includes the weight of Coloumes, beam girdus electrical Fixture and other attachment

2) LIVE LOADS:

Live load can vary both in their magnitude and location, these loads are caused by weights of temporaily objects, moving vehicles natural forces, consists of additional protection against excess deflection and overload.

Examples:

The Live Floor loading in classroom consists of desks, chairs, and laboratory equipment.

Types of Structures:

The combination of structural elements and the material which functions as a structural system units of one or more of foure types of structure.

1) TRUSSES:

Tusse consists of slender elements in triangular form. Due to geometric arrangements of its members binds are converted into tensile or compressive forces in members.

* Planar teusses are composed of members, livs in some plane and used for bridges and roof support
* Space teusses ~~ehave~~ members eutinding in three dimension and used for duricks and teusses

2) CABLES & ARCHES:

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

* Cables are flexible and carry loads in tension they are commonaly used to support bridges. roofs.
* Arches achieves strength in compression and has a revers curvature to cable. It must be rigid to maintain its shape. Consists of shear and moment. they are used in bridges. structures, dome roofs and openings.

3) FRAMES:

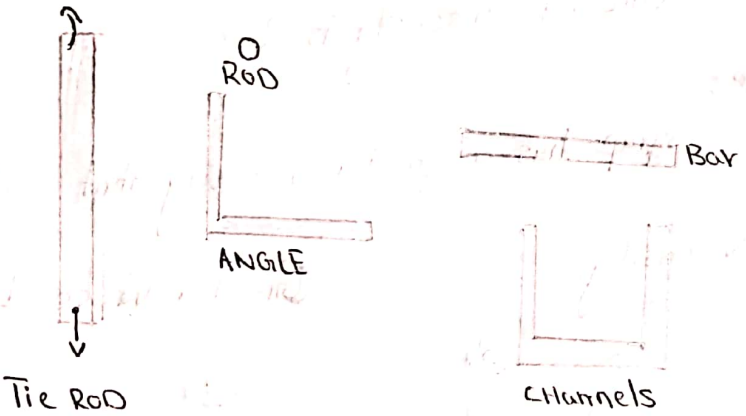
Types of structure which are used in buildings and consists of beam and columon which are fixed or pin connected. The bad on frames causes bindings of its members and has rigid point connections. This structure is indeterminante.

STRUCTURE ELEMENTS:

Some of element are

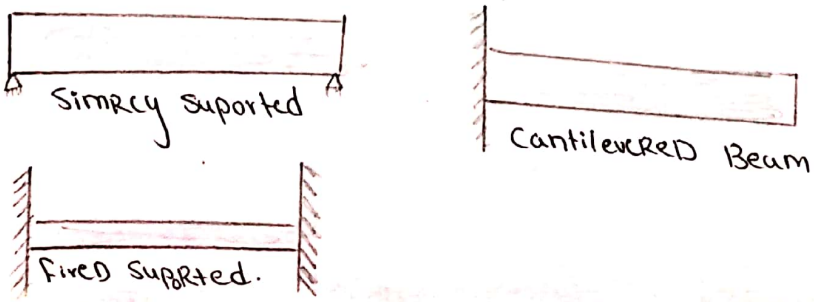
1) TIE RODS:

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



a) BEAMS:

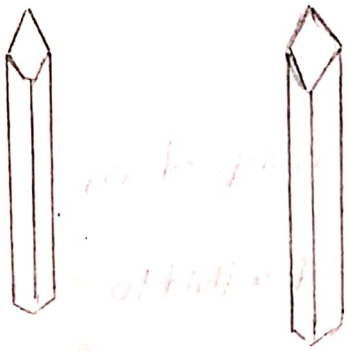
They are horizantal members and supports vertical loads. It resists bending moments short every large loads.



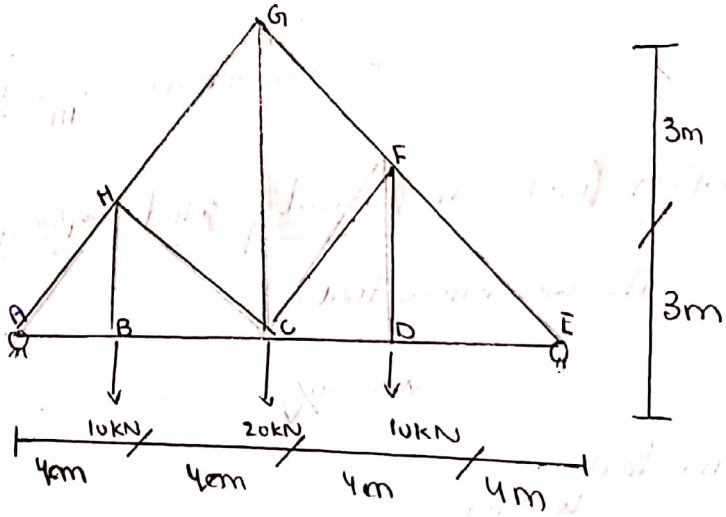
3) Columns:

They consist of vertical members and resists compressive loads.

Tubes and wide-flange cross section are used For metal columns and square cross section rods are used for concrete work.



Question No 2



Force in each number = ?

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Solution:

Support Reaction:

$\Sigma F_y = 0 \uparrow \downarrow$

$R_A + R_E = 40$ — (A)

$\Sigma M_A = 0$ ↻+

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

$R_E = 320/16 = 20kN$

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

Now determining force in each number.

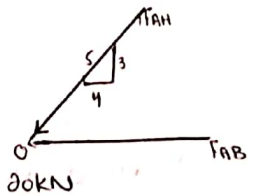
Joint A

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

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

$F_{AM} = 33.33kN$ (C)

Joint A:



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

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

Joint B:

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

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

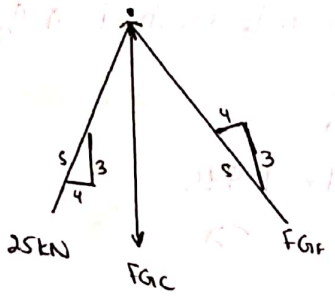
Joint G

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

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

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

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



Joint 4

JOINT H:

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

$\Sigma F_H = 0;\ 4/5\,(33.33k_N) - 4/5\,(F_{HC}) - 4/5\,(F_{HG})$

Solving eq (1) & eq (2)

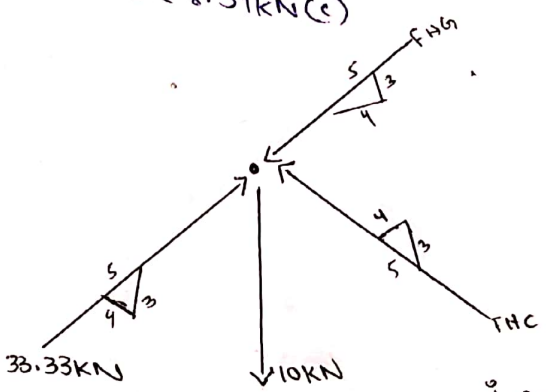
$19.98 - 10 + 0.6F_{HC} - 0.6F_{HG} = 0$ — (A)

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

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

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

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



Joint H:

Due to Symmetrical loading & Geometry

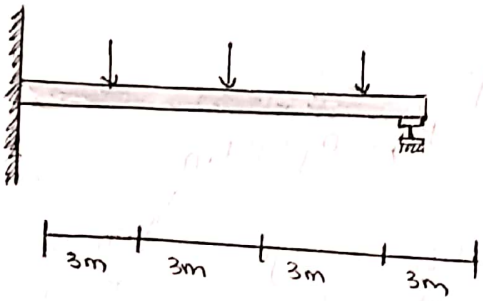
$F_{AB} = F_{CD} = 26.66\,kN$ (T)

$F_{BC} = F_{DC} = 26.66\,kN$ (T)
$F_{BH} = F_{DF} = 10\,kN$ (T)
$F_{AG} = F_{FG} = 25\,kN$ (C)

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

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

Question No 3

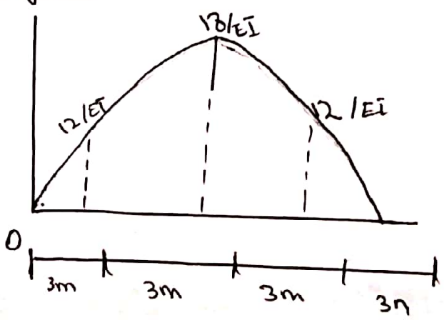


Given:

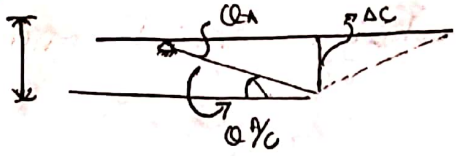
$E = 200\,Gpa$, $I = 6 \times 10^6\,mm$

Determine slope at point (1) and displacment at 'C' using moment area theorem

Moment Diagram:



ELASTIC CURVE:



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

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

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

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

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

$$t_{A/C} = \left[\frac{1}{2}\left(\frac{18}{EI}\right)(3)\left(\frac{2}{3}(3)\right) + \left[\frac{12}{EI}(3)\right]\left[3+\frac{1}{2}(3)\right) + \left[\frac{1}{2}\left(\frac{6}{EI}\right)(3)\right]\left(3+\frac{2}{3}(3)\right)$$

$$= 0.200 \text{ m}$$

So:

$$\Delta C - t_{A/C} = 0.200 \text{ m}$$

$$= 200 \text{ mm} \quad \underline{\text{Ans}}$$