NAME:- OWAIS USMAN

ID:- 7897

SECTION:- A

SEMESTER:- 4

SUBJECT:- STRUCTURE ANALYSIS

SUBMITTED TO:- ENGR. AMJAD ISLAM

Q No. 1

Write a detail note in your own words on different types of loads that different types of structures are designed to support throughout its life. Elaborate with examples.

ANSWER:

LOADS:

It is the dimensional requirement for a structure necessary to determinent the loads the structure most support.

TYPES OF LOADS:-

★ DEAD LOAD:

It consist of structural members that are perminently attached to structure. Dead load include the weights of colomns, beams garders, electoical features and other attachments.

★ LIVE LOADS:

live load can vary both in their magnitude and location. These loads are caused by weights of temporarily object, moving Verticles natural forces consist of additional Protection against excess deflection and overload.

EXAMPLES:

The live load for loading in classroom consists of desks, chairs and laboratory equipments.

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 force.

1) TRUSSES:

Trusses consist of stander elements in triangular form. Due to geometric arrangements of its member bonds are converted into inside compressive forces in members.

* Planner trusses are composed of members lies in sameplane and used for bridge and roof support.
* Space trusses have members outanding in there dimensions and used for dricles and towers.

2) FRAMES:

Type of structure which is used in buildings and consists of beams and column, which are fixed or pin connected. The loads on frames causes bendings of its members and has rigid joint connection. This structure is indeterminent.

3) CABLES OF ARCHES:

It is the type of structure to span long distances.

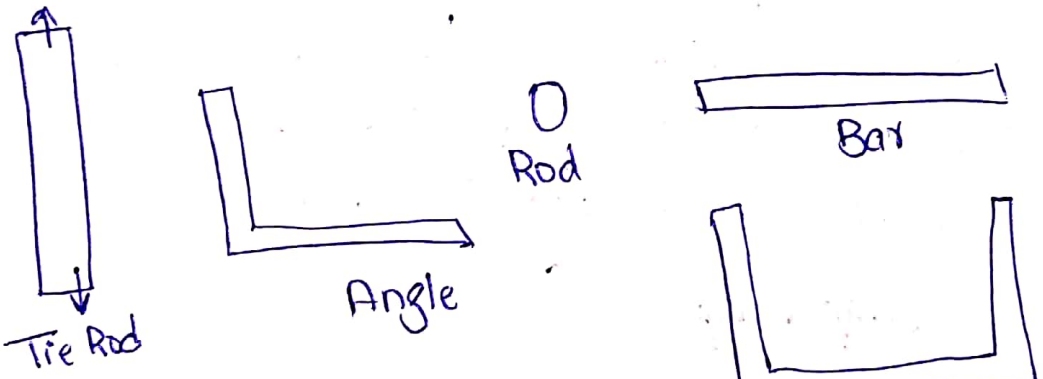
* Cables are flexible and carry loads in tension. They are commonly used to supports bridges, roofs.
* Arches achieve strength in compression and has a reuses. Carvature to cable. It must be rigid to maintan. They are used in bridge structures, dams, roofs and openings.

STRUCTURE ELEMENTS.

Some important structure elements are

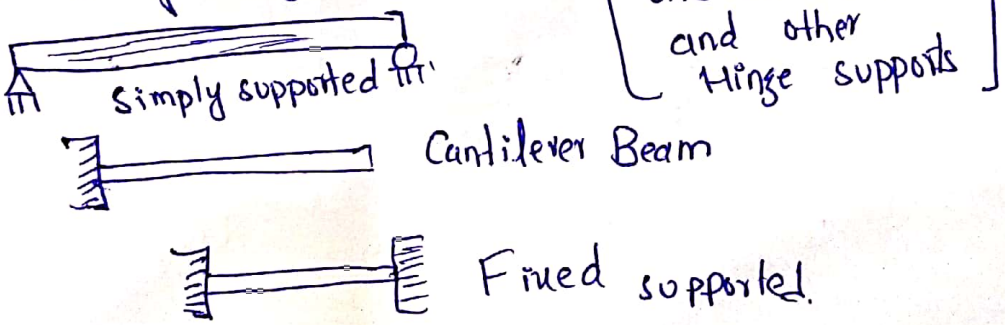
1) TIE RODS:

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



2) BEAMS:

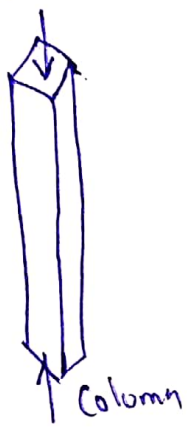
The horizontal member of structure which supported vertical loads. It resist bending moments short carry large loads.

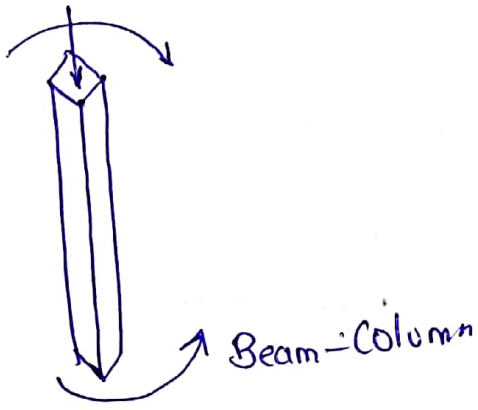


(3) COLUMNS:

The vertical member of structure that support horizontal loads and resist compressive load.

Tubes and wide flage across sections are used for metal columns. and square cross sections rods are used for concrete work.

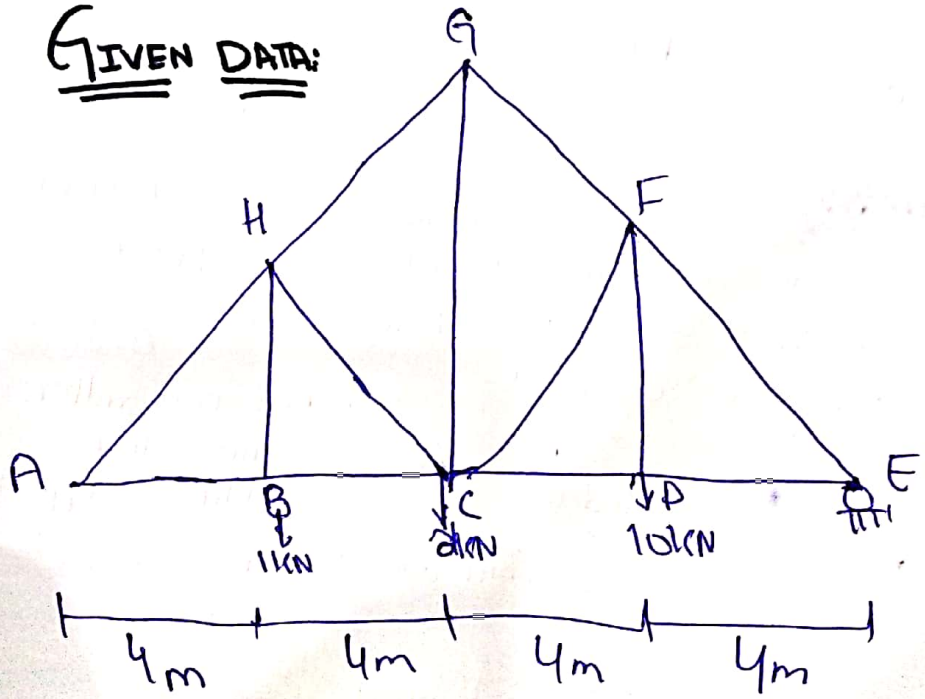




Q NO 2

Determine the force in each member of the truss. State if the members are in tension or compression. Assume all members are pin connected.

GIVEN DATA:



REQUIRED DATA:-

Forces in each members = ?

SOLUTION:-

Support reaction

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

$R_A + R_E = 0 \quad \curvearrowleft -$

$R_E(10) + 10(2) + 20(8) + 10(4) = 0$

$R_E = \frac{320}{16}$

$\boxed{R_E = 20\,kN}$

$40 - R_E = 40 - 20$

$\boxed{R_A = 20\,kN}$

Now determining force in each member

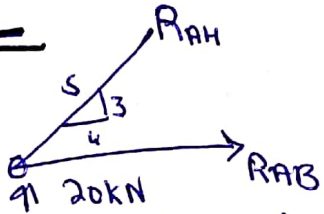
Joint A:-

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

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

$F_{AH} = 33.33kN.\ (c)$

Joint A



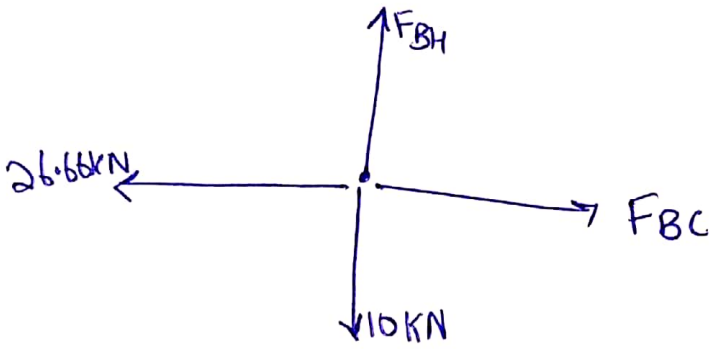
$\Sigma f_x = 0; \quad -4/5(33.33) + R_{AB} = 0$

$\boxed{F_{AB} = 26.66kN}$

Joint B:-

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

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



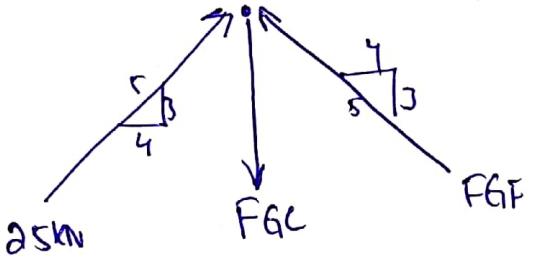
Joint G:-

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

$R_{GF} = 25\,kN\,(c)$

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

$F_{GC} = 30kN\,(c)$



Joint H:

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

$\Sigma F_x = 0$; $\frac{4}{5}(33.33) - \frac{4}{5}(F_{HC}) - \frac{4}{5}(F_{HG})$

Solving eq ① and ②

(A)

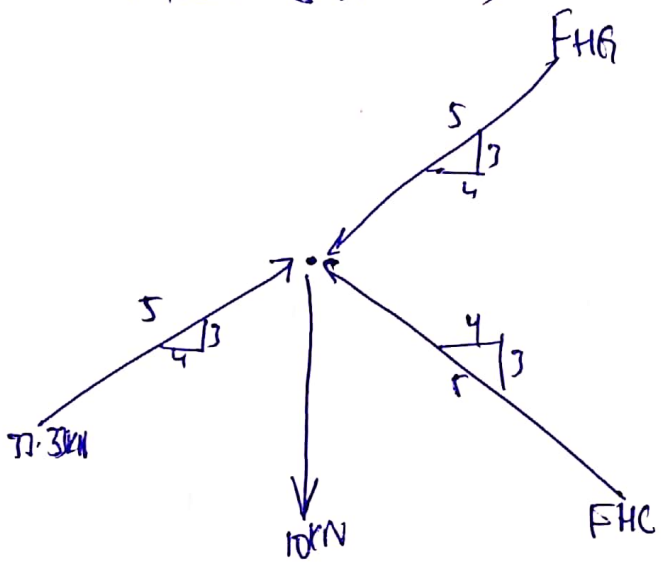
$19.98 - 10 + 0.6\,F_{HC} - 0.6\,F_{HG} = 0 \rightarrow (A)$

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

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

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

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



Due to symetrical loading & Geometry.

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

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

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

$F_{HG} = F_{GF} = 25\ kN\ (T)$

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

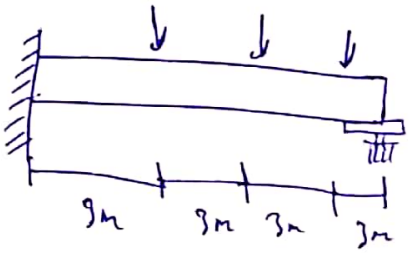
$F_{AH} = F_{EF} = 33.3\ kN\ (C)$

Q NO 3

Determine the slope at A and displacement at C of the beam in the figure by

a) Moment Area Theorem.

GIVEN DATA:



$E = 200 GPa \quad I = 6 \times 10^6 mm$

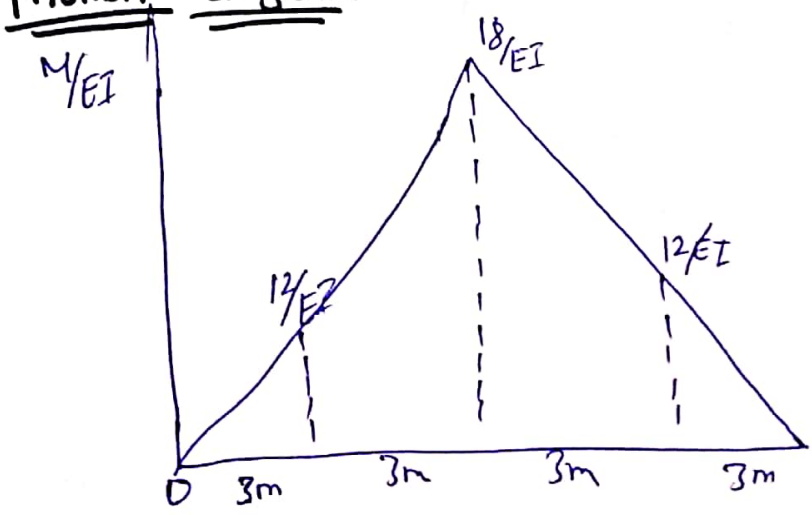
REQUIRED DATA:

Determine the slope at point A and displacement at C using Moment area theorem.

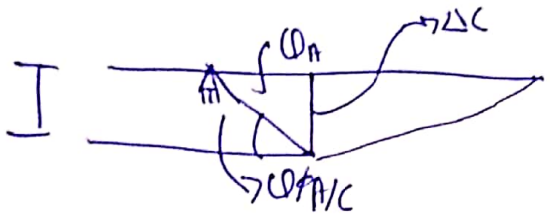
SOLUTION:

1) Finding out M/EI Diagram of elastic curve.

Moment diagram:



Elastic curve:



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

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

$$\theta_{A/C} = \frac{63}{EI}$$

$$\theta_A = \frac{63}{(200\times10^6)(6\times10^6)(100)^{-4}}$$

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

$$\theta_A = 6.052°$$

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

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

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

$$= 202 \text{ mm}$$

END