Question No 1.

Write detail note on your own words on different types of loads that different types of structure are disgned to support through out its life.

Answer:-

Loads:- Dimensial requirement for a structure nessessary to determine the loads the loads the structure must support.

Types:-

1:- Dead load:-

⇒ Consists of structure member,
⇒ Permantly attached to structure.
⇒ Include the weight of colums, beams, girdes, electrical fixtes etc.

2:- Live loads:-

* Caused by weight of temperoly objects.
* load can vary both in their magnitude and locution.
* Moving vehcils.
* Natural forces.
* Overload.

Example:- The live pelous loading in class room consist of chairs and laboratory equipments.

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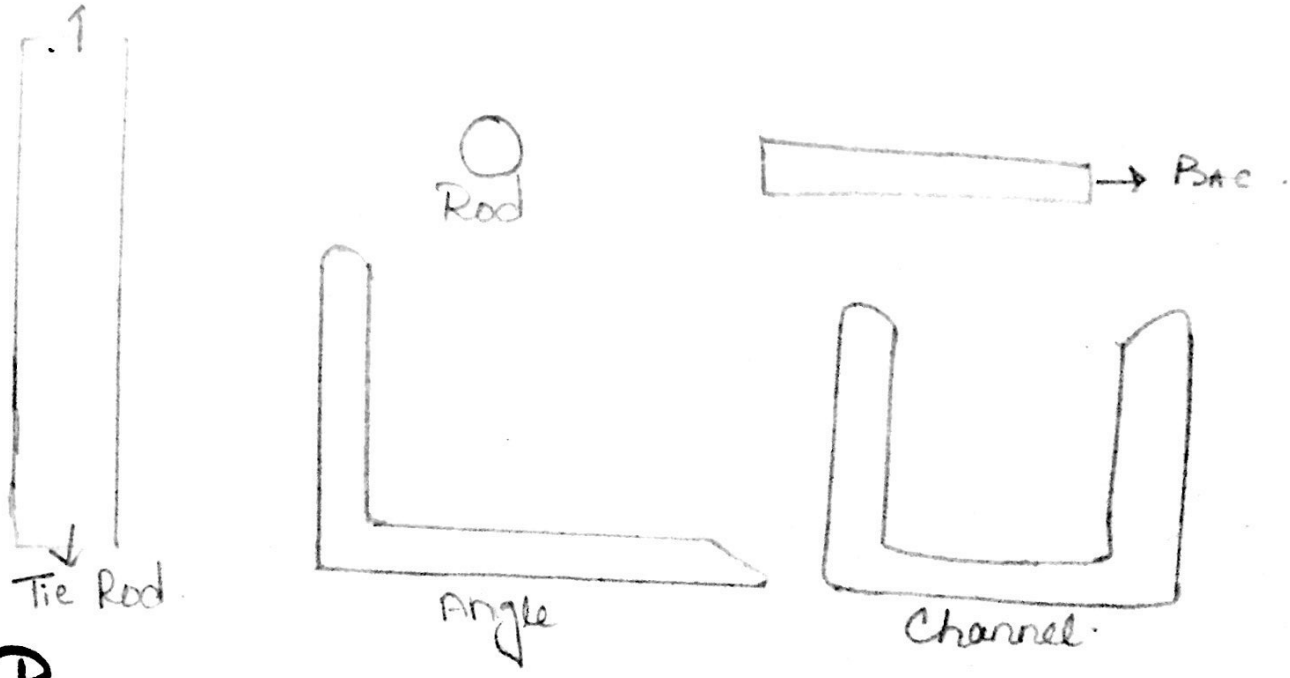
Structure Elements-

Some of elements are.

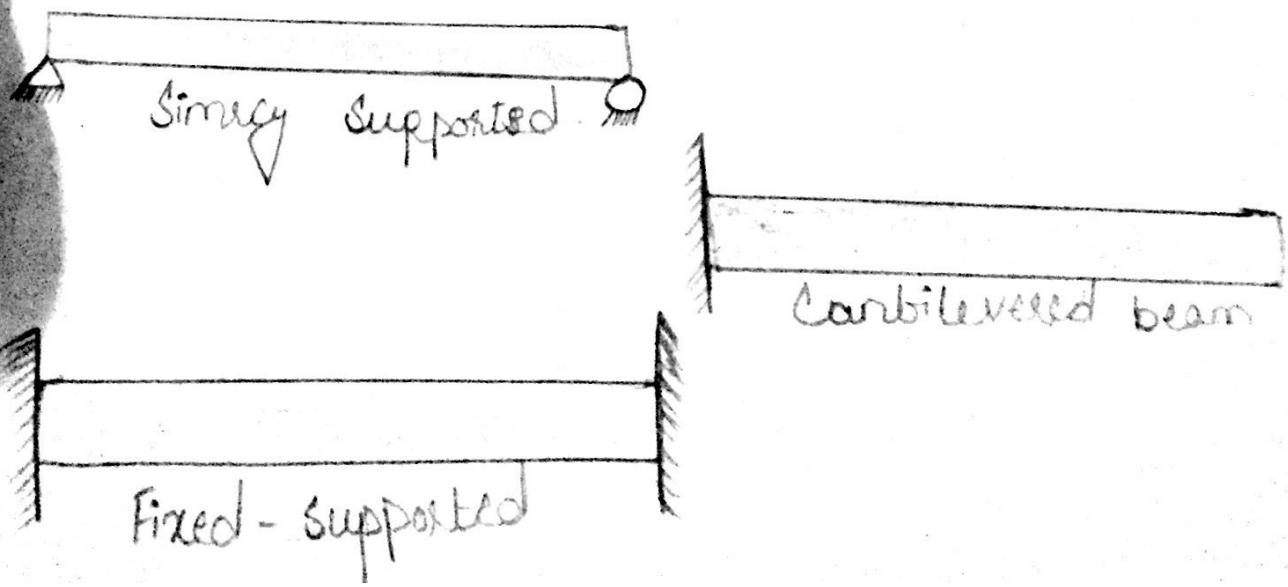
1- Tie Rods-

Consists of inside force. These members are denoted, bars or rods.



Beams-

They are horizontal members and supports vertical loads. It resists bending moments, Short carry larger loads.



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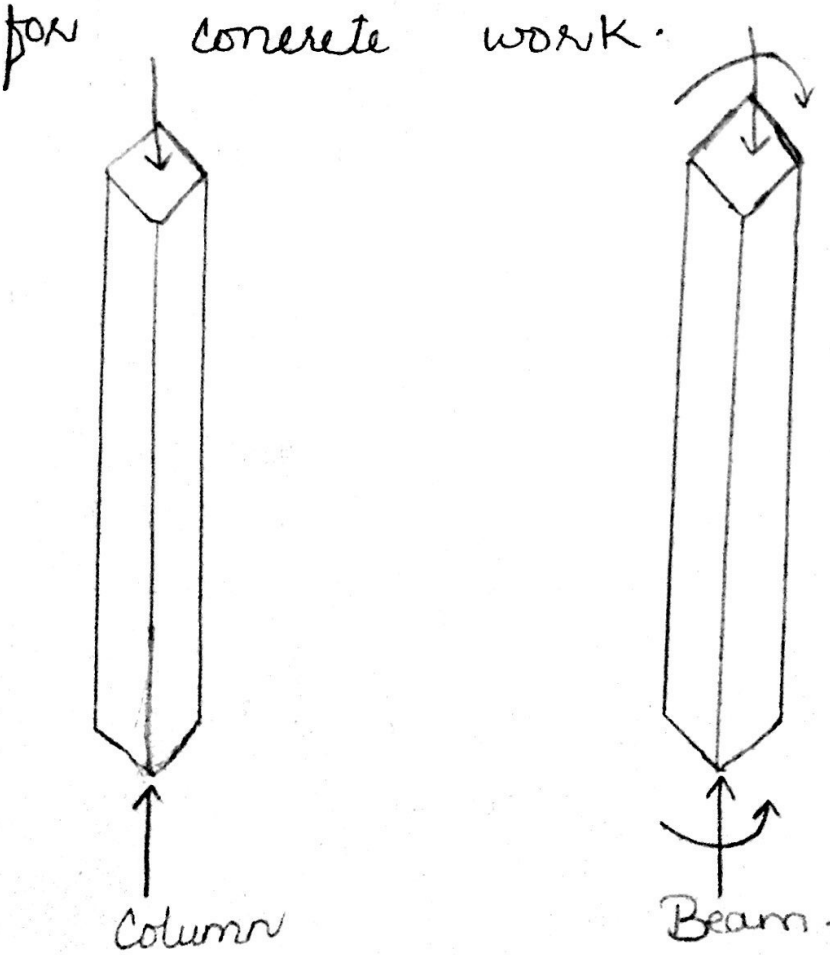
Columns:-

They Consists of Vertical members and resists Compressive loads.

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



Column

Beam - Column.

Types OF Structures:-

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 structures.

Different types of structures are:

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1. Trusses

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

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

→ Space trusses have members extending in three dimensions and used for cranes and towers.

2. Cables & Arches

It is the type of structures and to span long distances.

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

→ Arches achieves strength in compression and has a reverse curvature to cable. It must be rigid to maintain its shape. Consists of shear and moment. They are used in bridge structures, dome roofs and openings.

3. Frames

Type of structure which are used in buildings and consists of beams and column, which are fixed or pin connected. The load on frames causes bindings of its members and has rigid joint connections. This structure is indeterminate.

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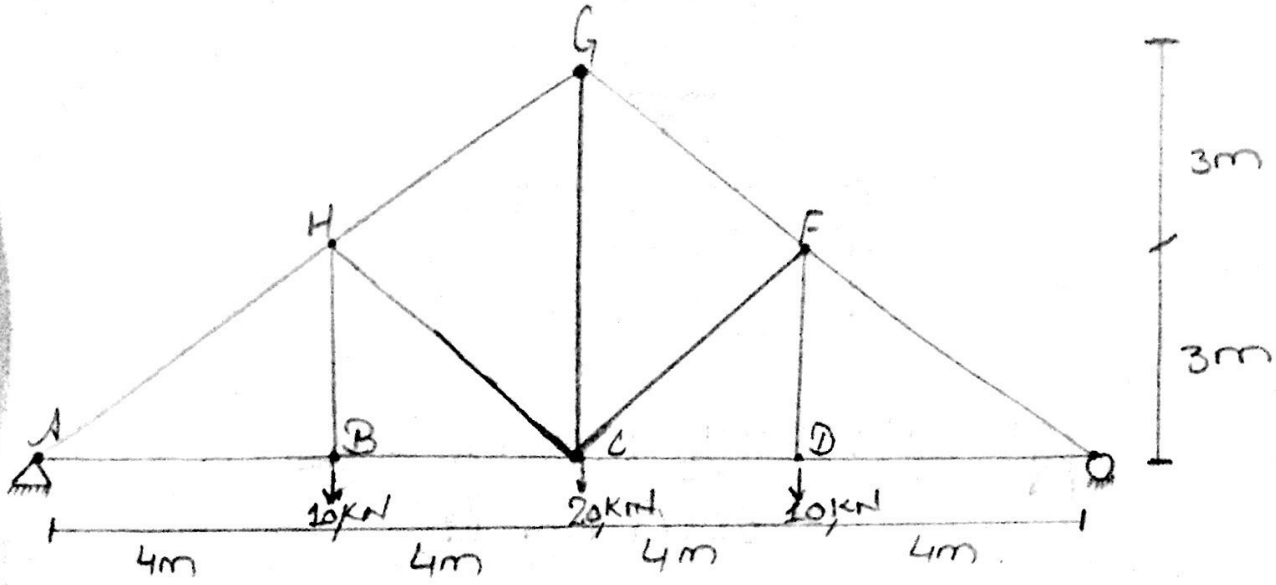
Question No 2:-



Required Data:-

Forces in each number = ?

Solution:-

Support reactions:

$$\Sigma F_y = 0 \quad \uparrow +\ \downarrow -$$

$$R_+ + R_E = 40 \longrightarrow (A)$$

$$\Sigma M_A = 0 \quad \circlearrowleft +$$

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

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

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

Now determining force in each member.

Joint A:

$$\Sigma F_y = 0 ; \frac{-3}{5}(FAH) + 20KN = 0.$$

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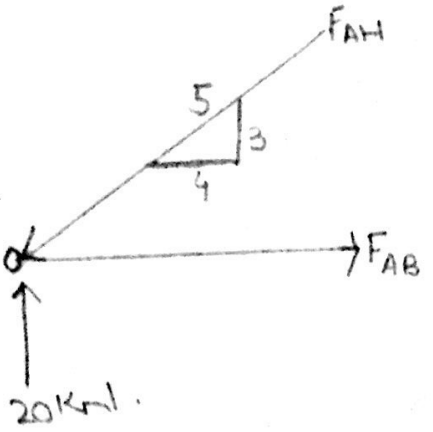
$= -0.6\,(F_{AH}) = -20\,kN$.

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

Joint A:



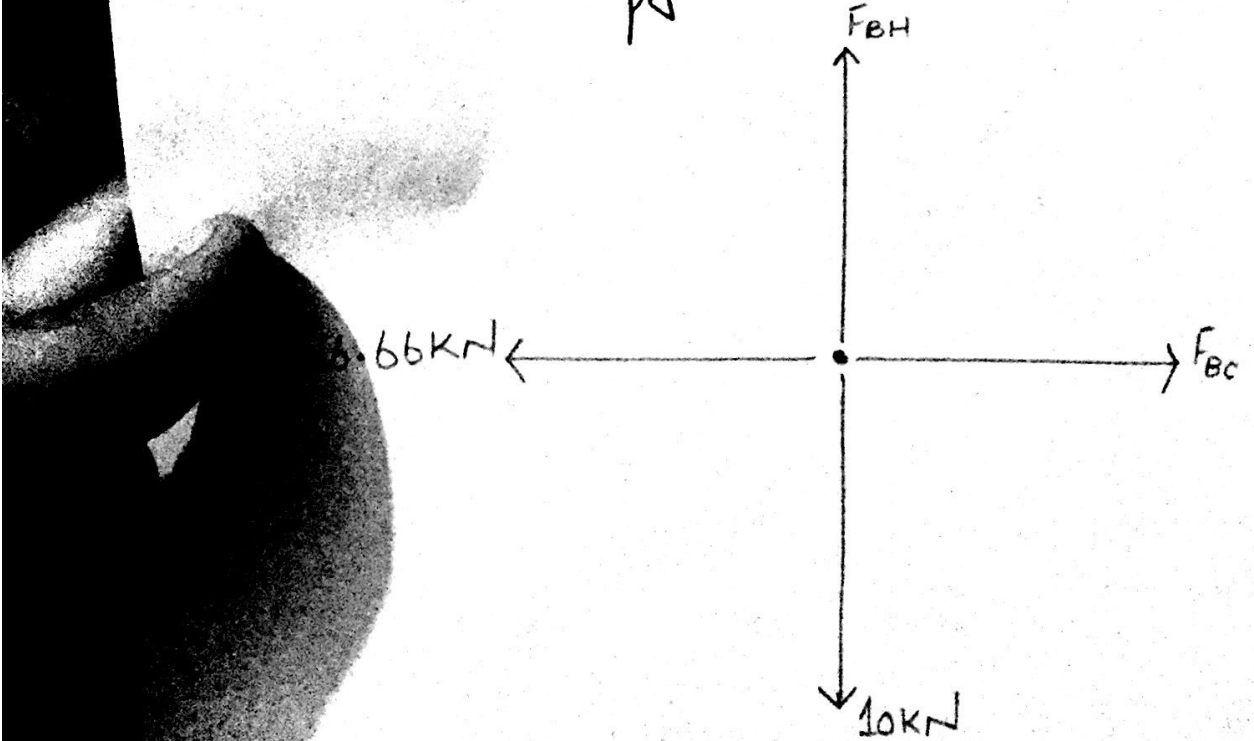
$\Sigma p_x = 0;\quad -4/5\,(33.33) + F_{AB} = 0$.

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

Joint B:

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

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



Joint B:

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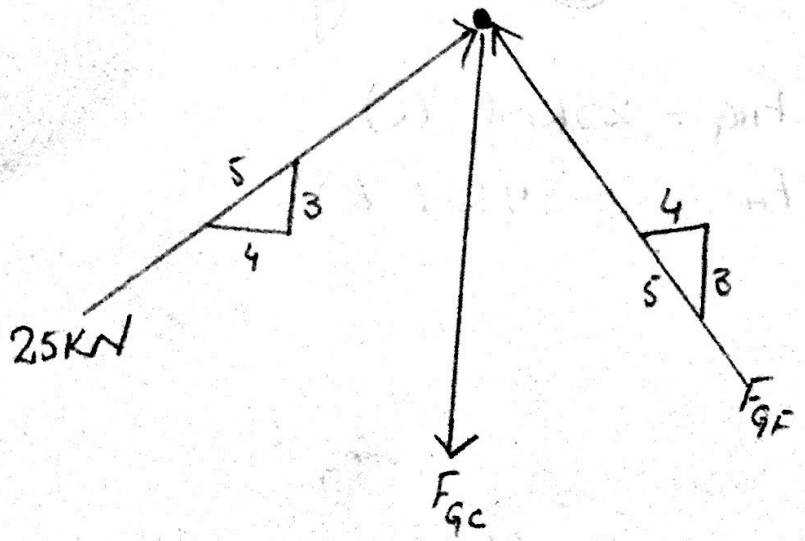
Joint G:-

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

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

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

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



Joint G:

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Joint H:

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

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

Solving equation (1) & equation (2).

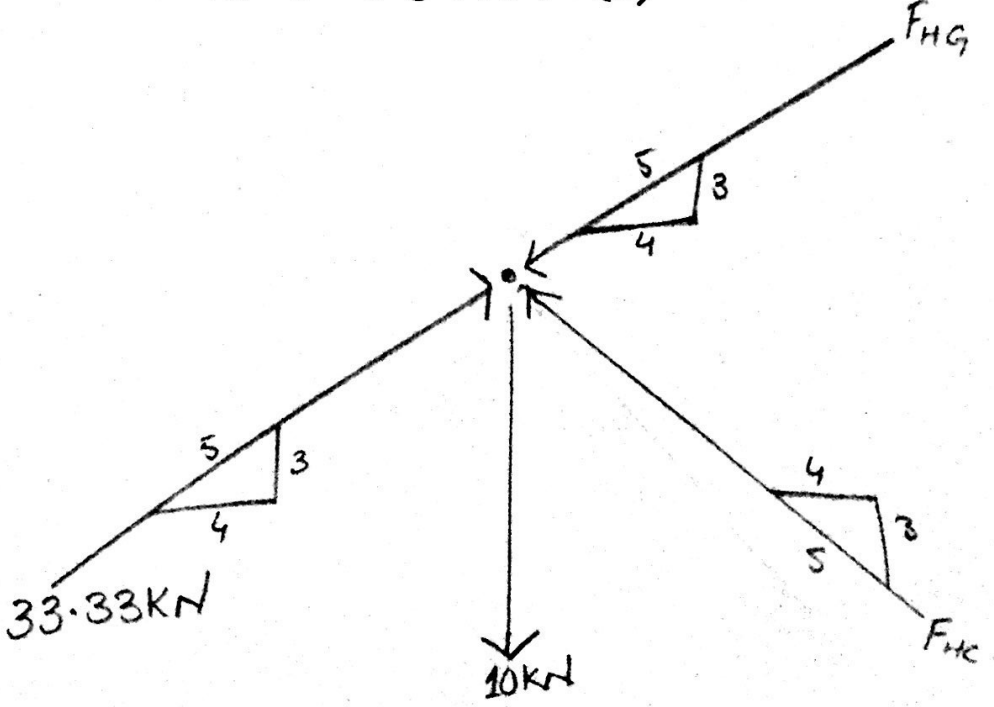
$$19.98 - 10 + 0.6\,F_{HC} - 0.6\,F_{HG} = 0 \longrightarrow (A).$$

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

Multiplying eq (A) by 1.84 and then add with equation (B) we get.

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

$$F_{HC} = 8.84KN \ (C)$$



Joint H:

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Due to symmetrical loading & Geometry:

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

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

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

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

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

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

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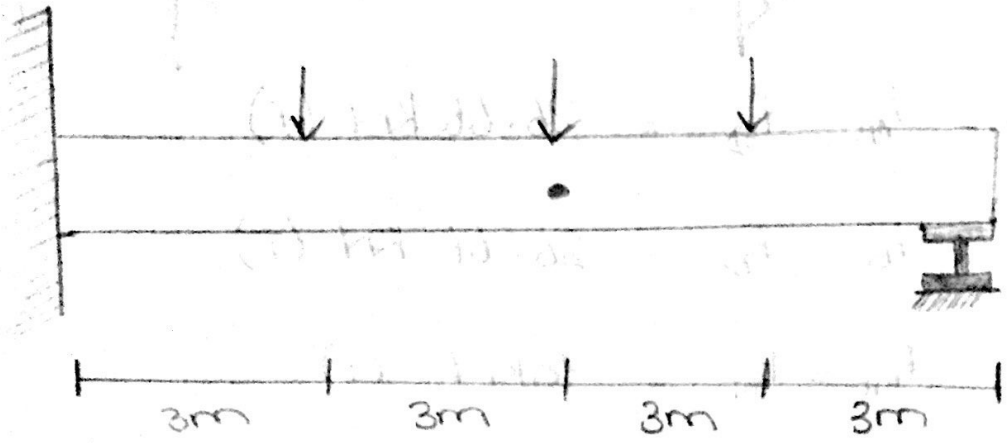
Question No 3:



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

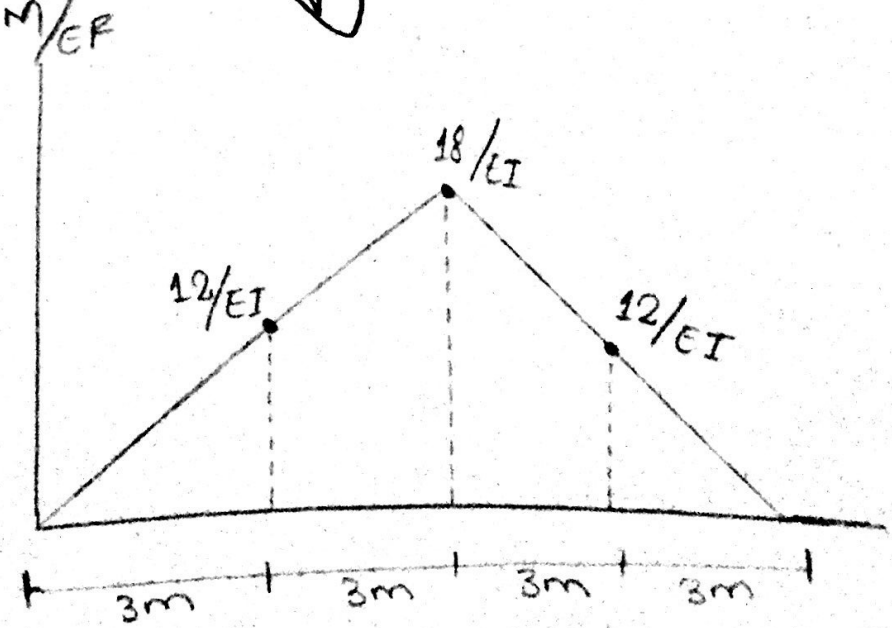
Determine slope at point (A) and displacement at (C).

using Moment Area theorm.

Solution:

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

Moment Diagram:



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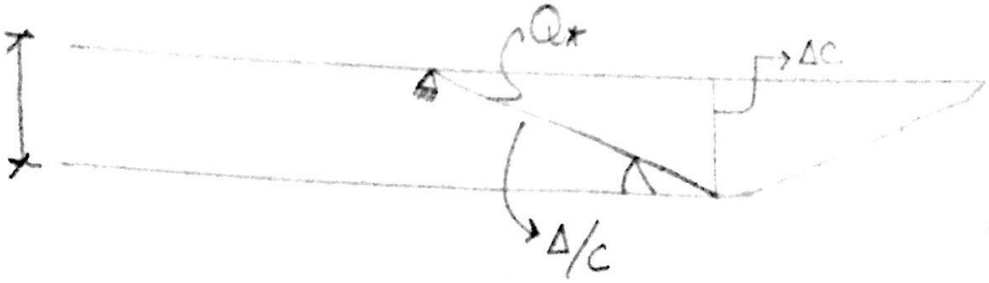
Elastic Curves



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

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

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

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

$$\boxed{\theta_{A} = 0.0525 \text{ rad}} \quad \text{Ans}.$$

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

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

So.

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

$$\boxed{\Delta c = 202\text{mm}}$$

Ans.

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