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ID # 7943

SECTION # "B"

SUBJECT # STRUCTURAL ANALYSIS - I

SEMESTER # 4

QUESTION # 1:-

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 example?

ANS:- LOADS:-

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

TYPES OF LOADS:-

1) DEAD LOADS:-

It Consist of structural members that are permanently attached to structure. dead load includes the weight of columns, beams, girdus electrical fixtures and other attachements.

2) LIVE LOADS:-

Live load Can Vary both in their magnitude & location. These loads are caused by weights of temporarily objects, moving vehicals, natural forces. Consist of

additional protection against excess deflection & overload.

EXAMPLE:-

The line floor loading in Classroom. Consist of duts, chairs & laboratory equipment.

TYPES OF STRUCTURE:-

The Combination of structural elements & the material which function as a structural system. Each system Consist of one or more of four Type of structures.

1) TRUSSES:-

Trusses Consist of slender element in triangular form. due to geometric arrangements of its member bond are Converted into Tensile or Compressive force in members.

2) CABLES AND ARCHES :-

It is the type of stoucture Used to spuan long distances.

→ Cables ~~& arches~~ are flexible & carry eassy load in tension. They are Commonly Used to support bridges, roofs.

→ Arches achieves strength in Compression & has a Severs curvatures to Cable. It must be rigid to maintain its shape. Consist shear & moment. They are Used in bridge structures, dames roofs and openings.

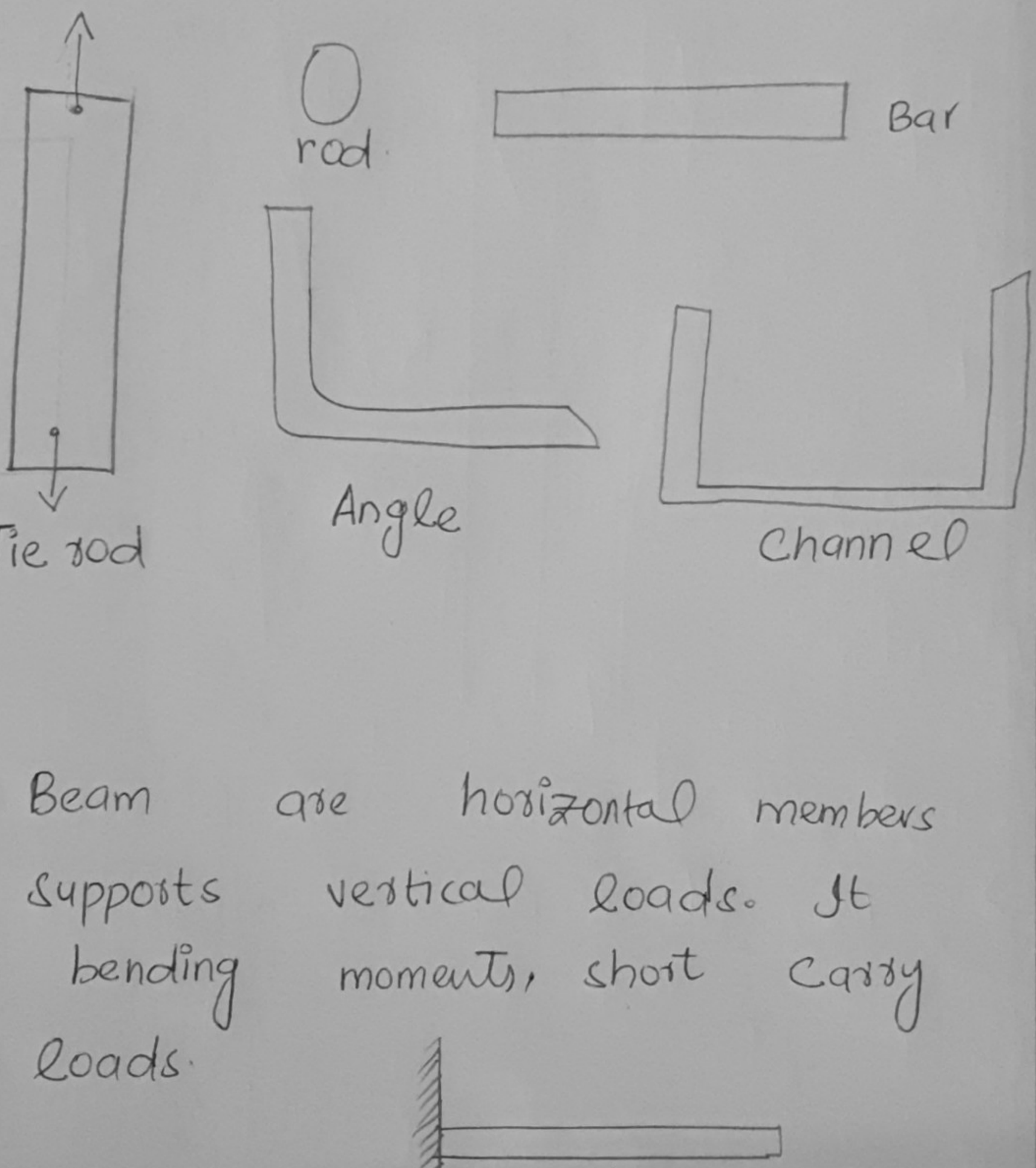
3) FRAMES

Type of stucture which are Used in buliding and Consist of beam & column, which are fixed or pin Connected. The bad on frame Causes bulidings of its members & has rigid point Connections. This Sprutura is indeterminantte.

→ STRUCTURAL ELEMENTS :-

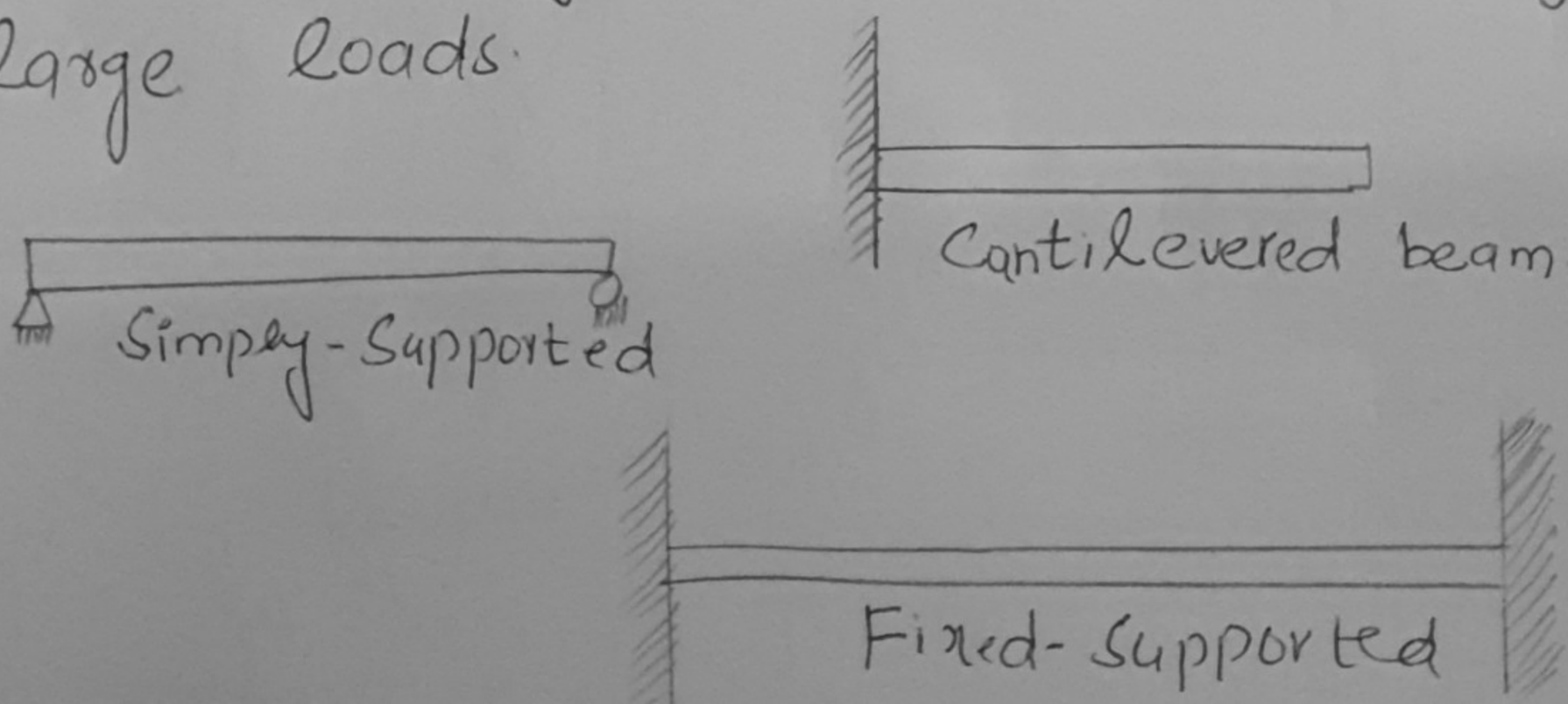
1) TIE RODS :-

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



2) BEAM :-

Beam are horizontal members and supports vertical loads. It resists bending moments, short carry large loads.

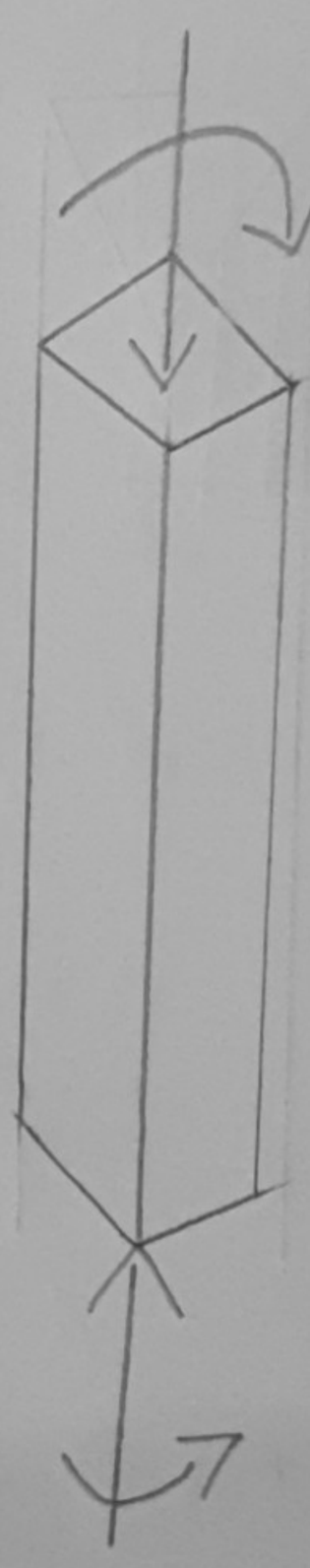


3) Columns:-

Columns are Consist of vertical members & resist Compressive load.

Tubes & wide-flamge across Section are Used for metal Columns. & Square Cross Sectionaf rods are Used for Concrete work.

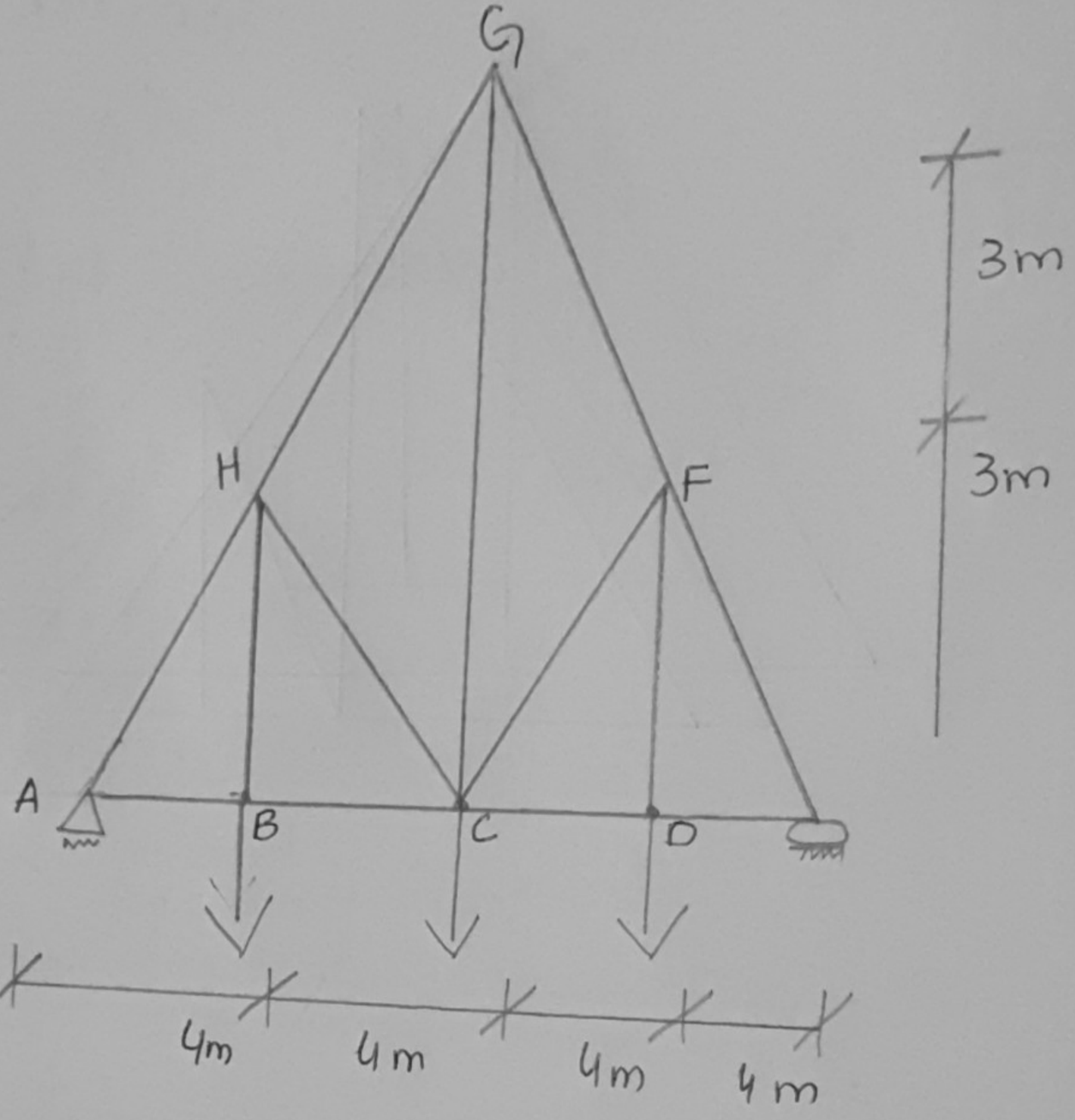
Column



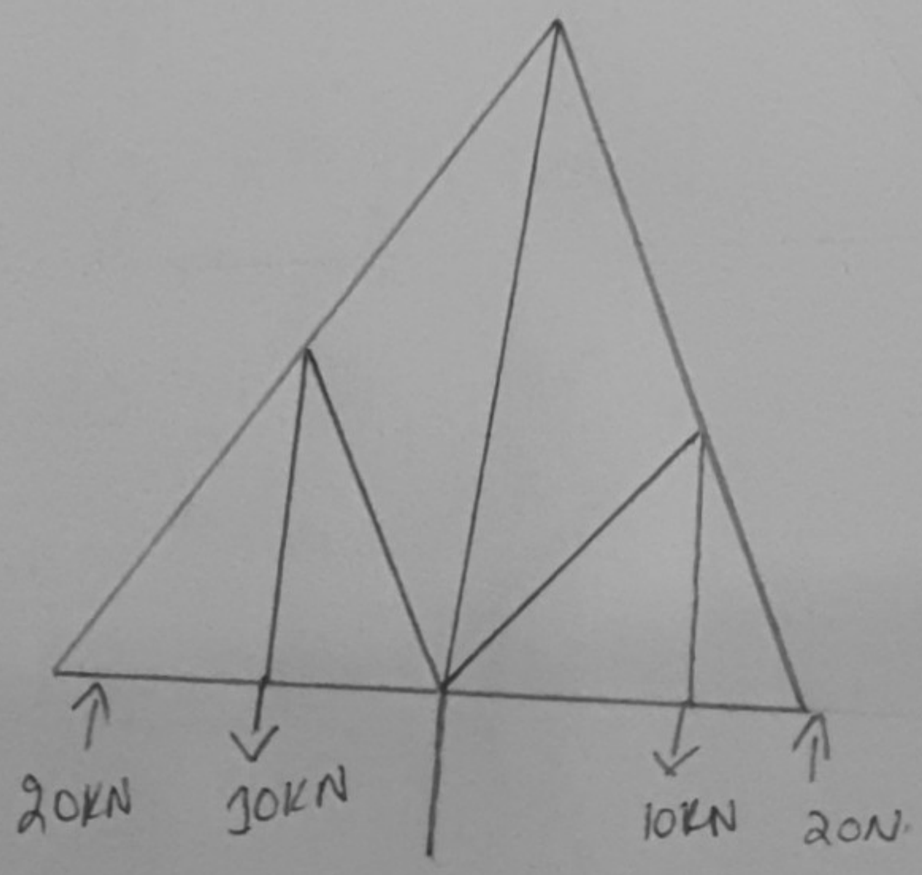
Beam-Column.

Question # 2

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



Solution:-



JOINT A :-

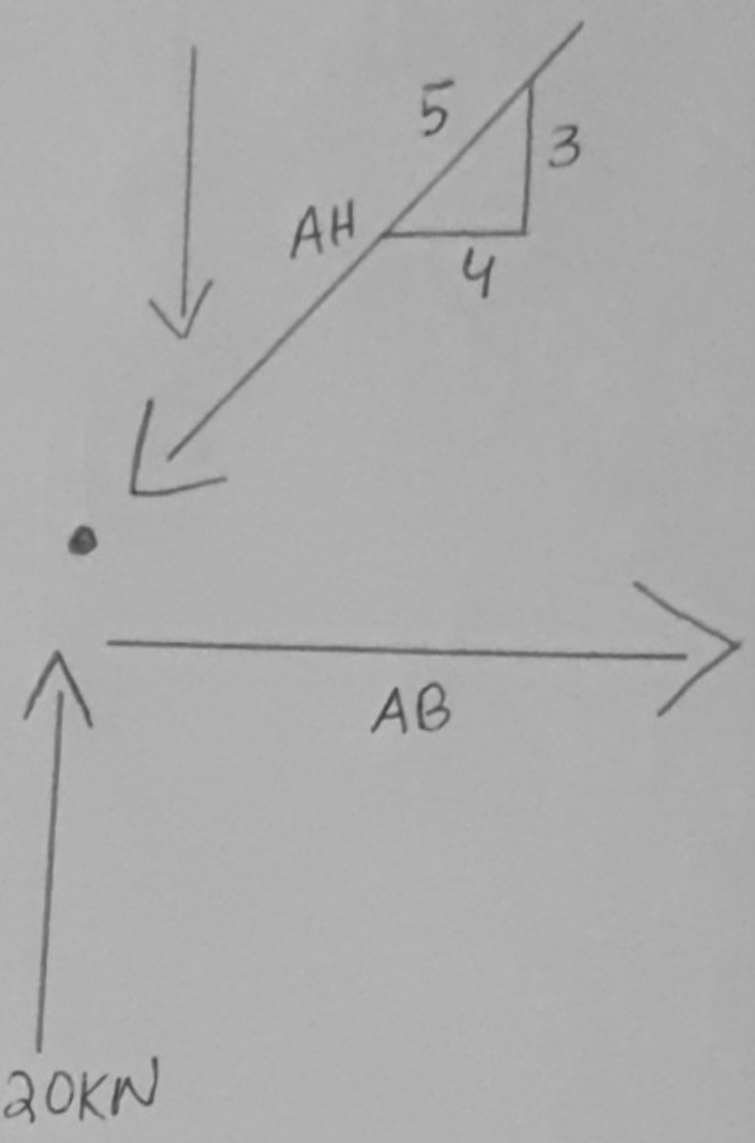
$\Sigma F_y = 0 \quad \uparrow +$

$-F_{AH} \sin\theta + 20KN = 0$

$-F_{AH}\ 3/5 + 20KN = 0$

$F_{AH} = 20 \times 5/3$

$$\boxed{F_{AH} = \frac{100}{3}\ KN}\ \text{(compression)}$$



$\Sigma F_x = 0 \quad \rightarrow +$

$-F_{AH} \cos\theta + F_{AB} = 0$

$-\frac{20}{3} \times 4/5 + F_{AB} = 0$

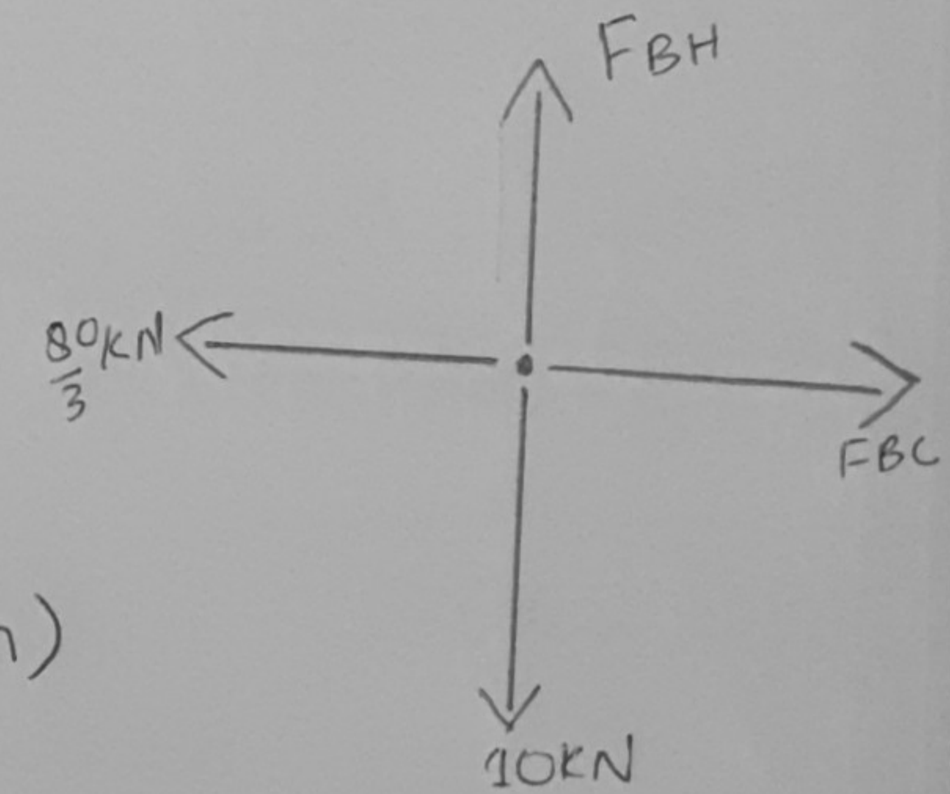
$$\boxed{F_{AB} = 80/3\ KN}\ \text{(Tension)}$$

JOINT B:-

$\Sigma F_x = 0; \rightarrow +$

$F_{BC} = \frac{80}{3}\ KN = 0$

$$\boxed{F_{BC} = 80/3\ KN}\ \text{(Tension)}$$



$\Sigma F_y = 0$

$F_{BH} - 10KN = 0$

$$\boxed{F_{BH} = 10KN}\ \text{Tension}$$

JOINT H

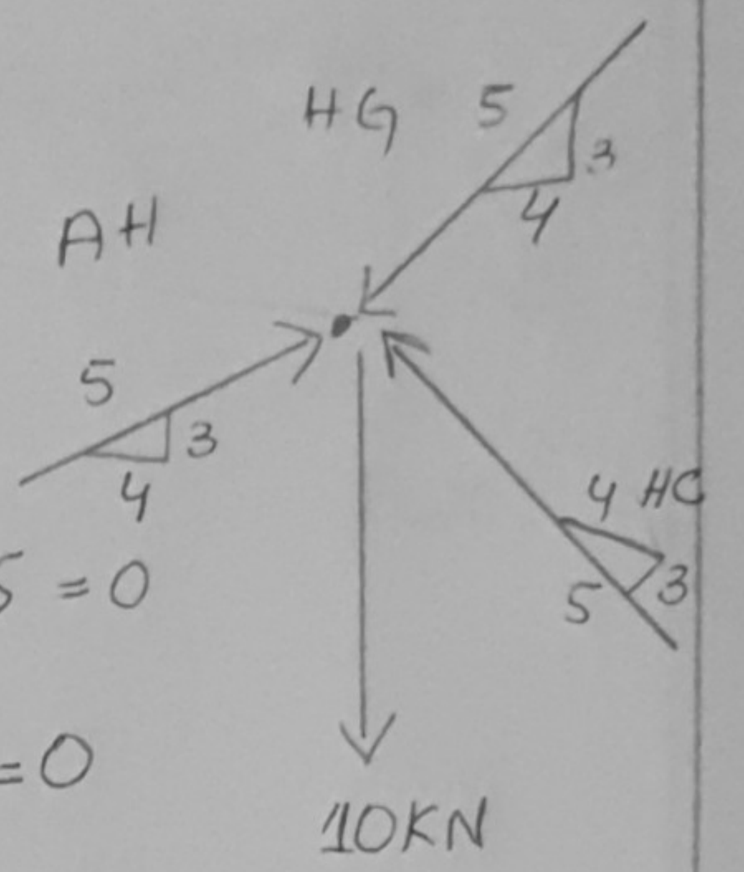
$\Sigma F_y = 0$ e $\uparrow +$

$$F_{AH}\sin\theta - F_{HG}\sin\theta - 10KN + F_{HC}\sin\theta = 0$$

$$\frac{100}{3} \times 3/5 - F_{HG} \times 3/5 - 10KN + F_{HC} \times 3/5 = 0$$

$$20KN - 10KN - F_{HG} \times 3/5 + F_{HC} \times 3/5 = 0$$

$$\boxed{F_{HC} \times 3/5 - F_{HG} \times 3/5 = -10}$$



$\Sigma F_x = 0$ $\rightarrow +$

$$F_{AH}\cos\theta - F_{HC}\cos\theta - F_{HG}\cos\theta = 0$$

$$\frac{100}{3} \times 4/5 - F_{HC} \times 4/5 - F_{HG} \times 4/5 =$$

$$\boxed{F_{HC} \times 4/5 + F_{HG} \times 4/5 = 80/3}$$

$$3/5\,(F_{HC} - F_{HG}) = -10 \implies F_{HC} - F_{HG} = -10 \times 5/3$$

$$(F_{HC} + F_{HG})\,4/5 = 80/3 \implies F_{HC} + F_{HG} = \frac{80}{3} \times 5/4$$

$$2F_{HC} = 50/3$$

$$F_{HC} = \frac{50}{3 \times 2} = 8.33KN$$

$$\boxed{F_{HC} = \frac{50}{6}\ KN}$$ Compression.

$$F_{HC} - F_{HG} = -50/3$$

$$\frac{50}{6} - F_{HG} = -50/3$$

$$F_{HG} = 50/3 + 50/6 \implies \boxed{F_{HG} = 25\,KN}$$ Compressio

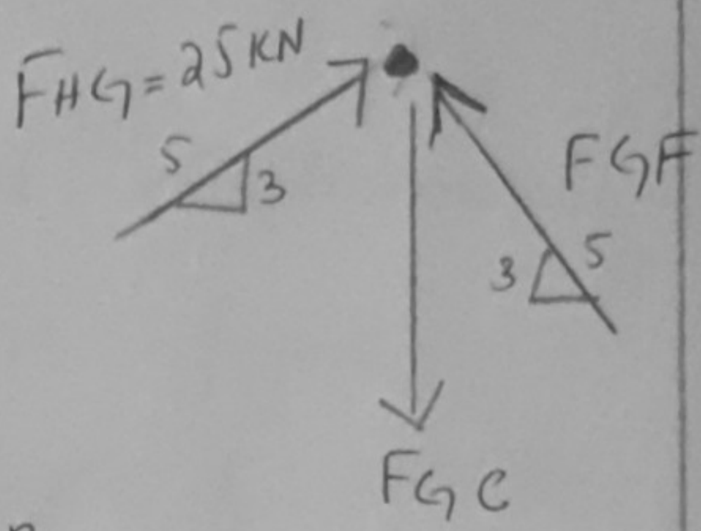
JOINT G :-

$\Sigma F_x = 0 \rightarrow +$

$F_{HG}\cos\theta - F_{GF}\cos\theta = 0$

$25 \times 4/5 - F_{GF}(4/5) = 0$

$\boxed{F_{GF} = 25}$ Compression.

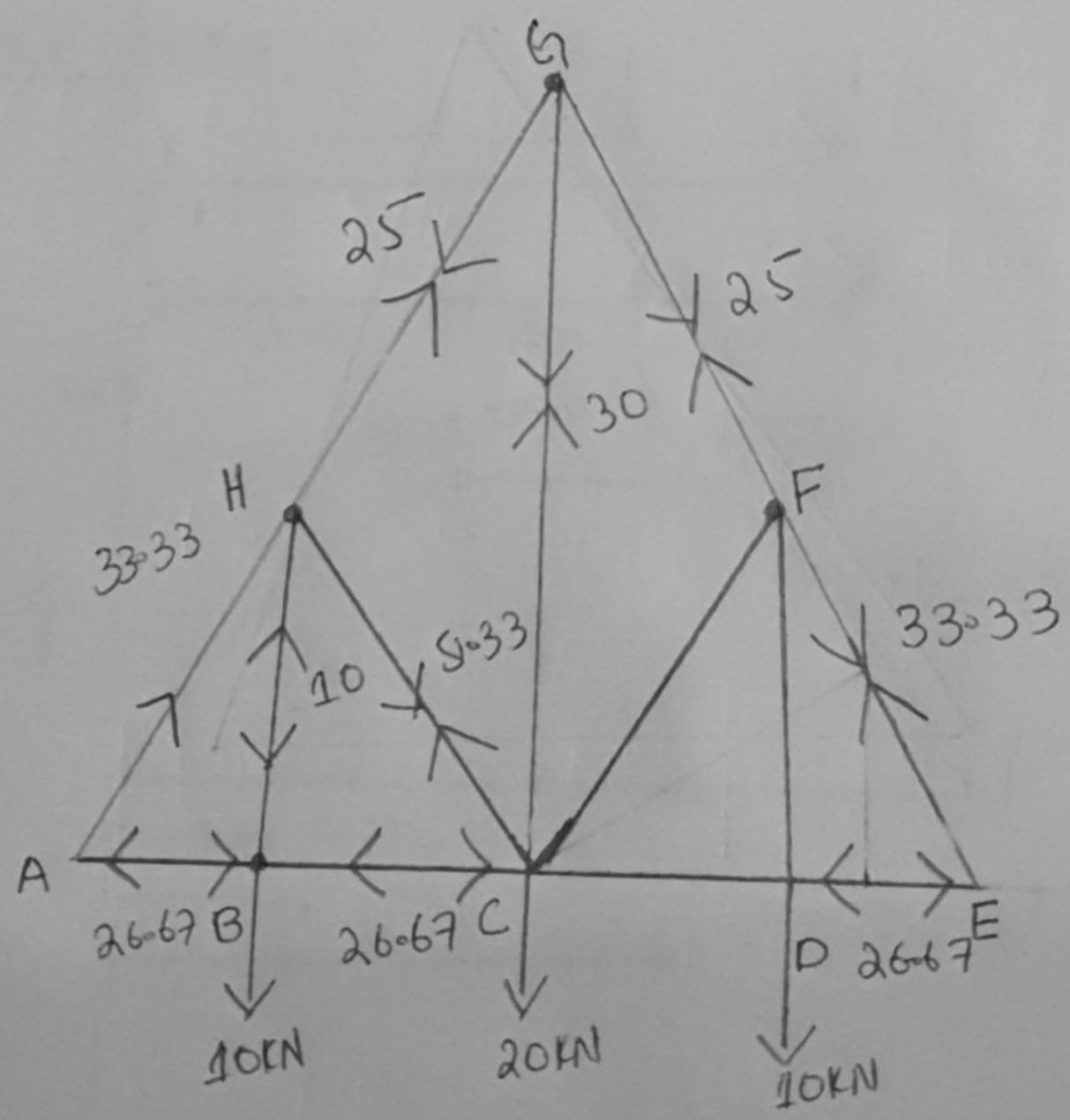


$\Sigma F_y = 0 \uparrow +$

$F_{HG} \times \sin\theta + F_{GF}\sin\theta - F_{GC} = 0$

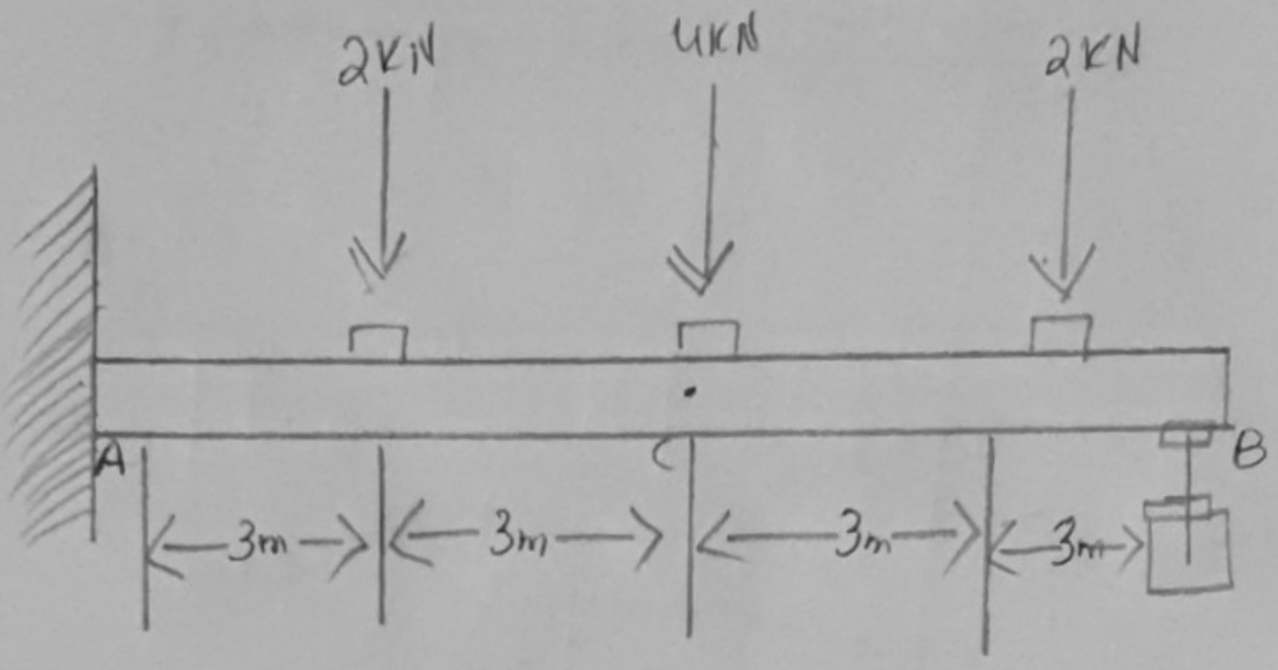
$25 \times 3/5 + 25 \times 3/5 - F_{GC} = 0$

$\boxed{F_{GB} = 30\text{KN}}$ Compression.



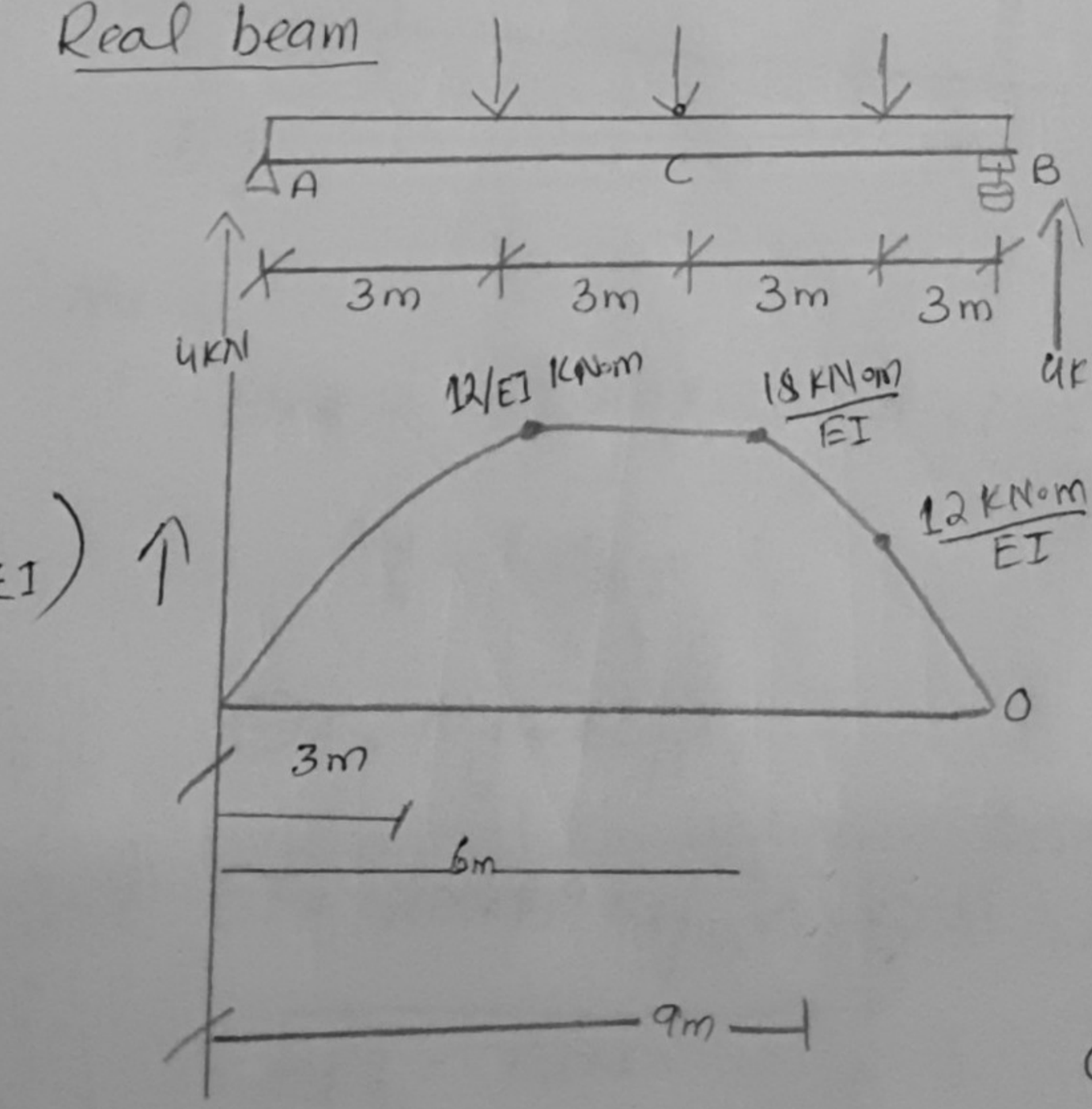
QUESTION # 3

Determine the slope at A and displacement at C of the beam in the figure by A) Moment-Area Theorm, & Take E = 200GPa, $I = 6(10^6)mm^4$.

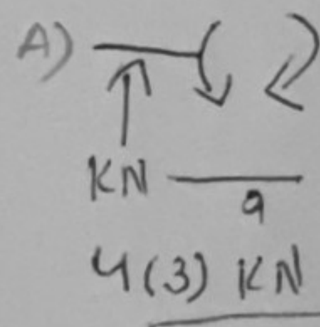


Solution :-

Real beam

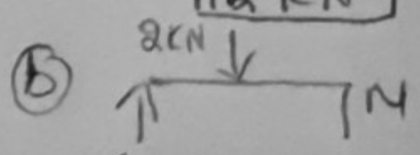


A)



12 KN

B)

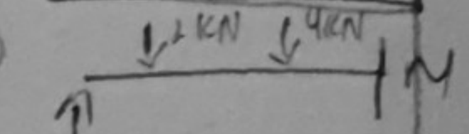


$M = 4 \times 6KN - 2 \times 3$

(24-6) KN

$M = 18 KN.m$

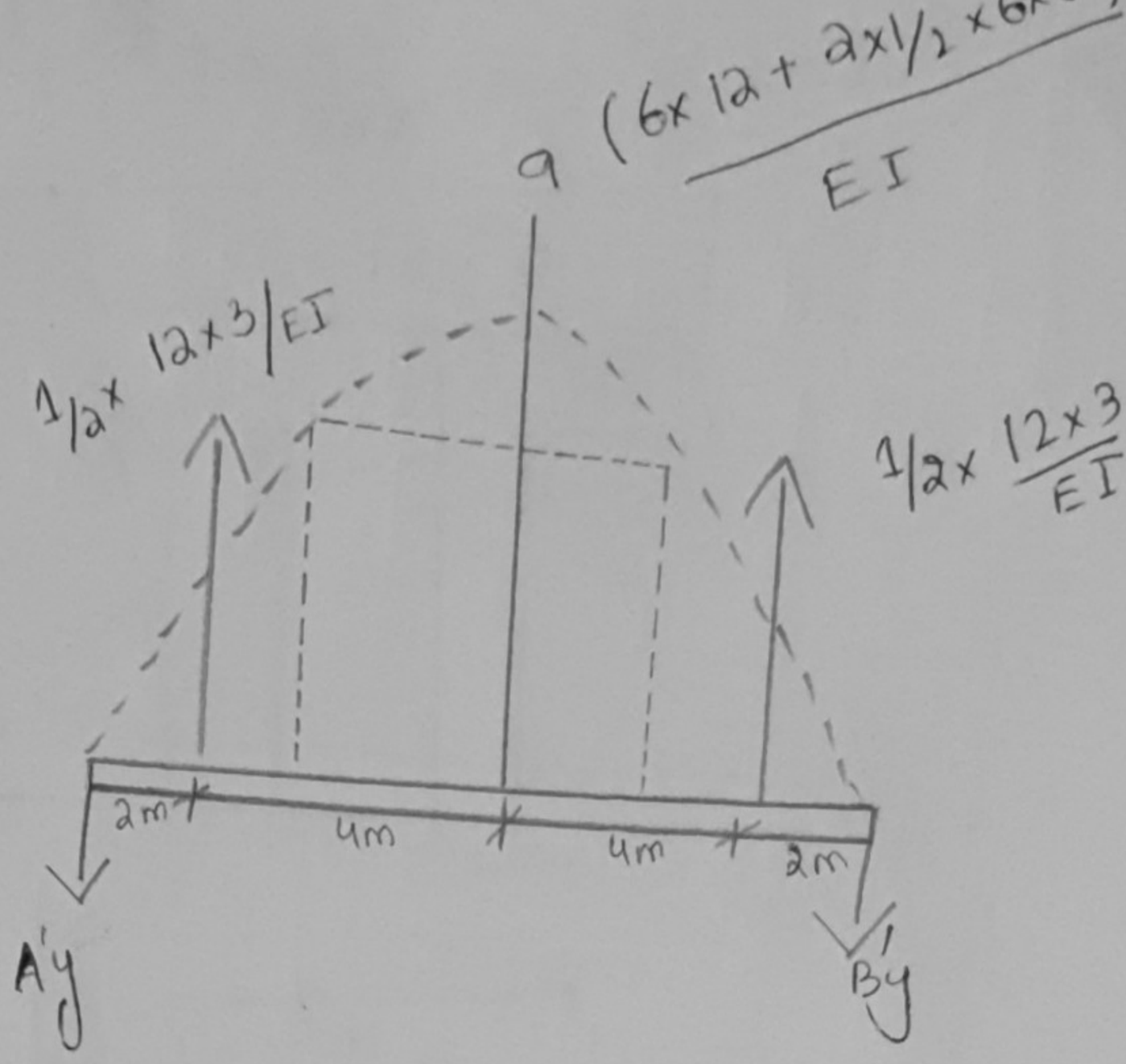
C)

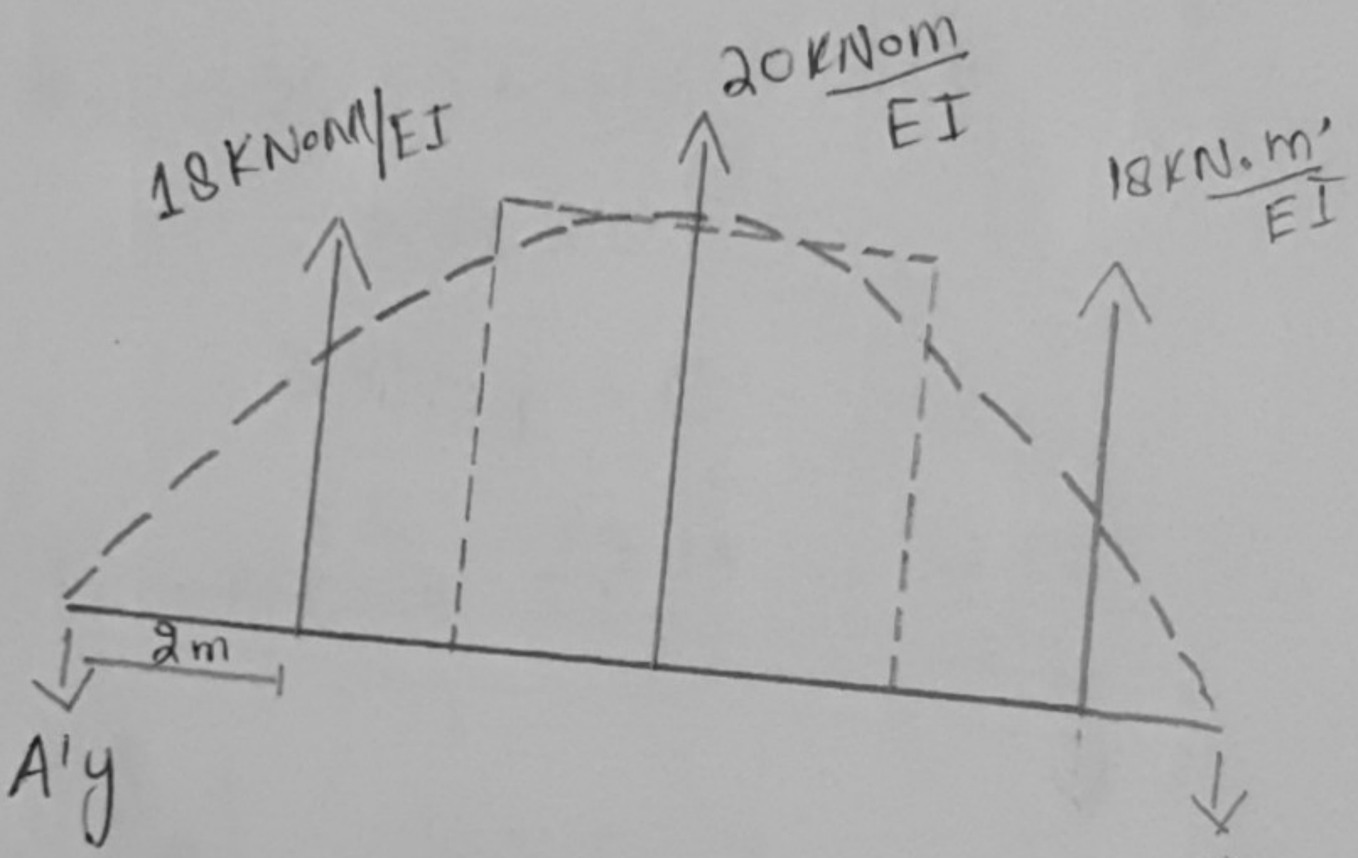


$4 \times 1 + 2 \times 6 - 9 \times 0$

12KN

Conjugate-Beam :-





$M_B = 0$

$$18 \times 2 + 90 \times 6 + 18 \times 10 - A'_y (12) = 0$$

$$A'_y = 63/EI$$

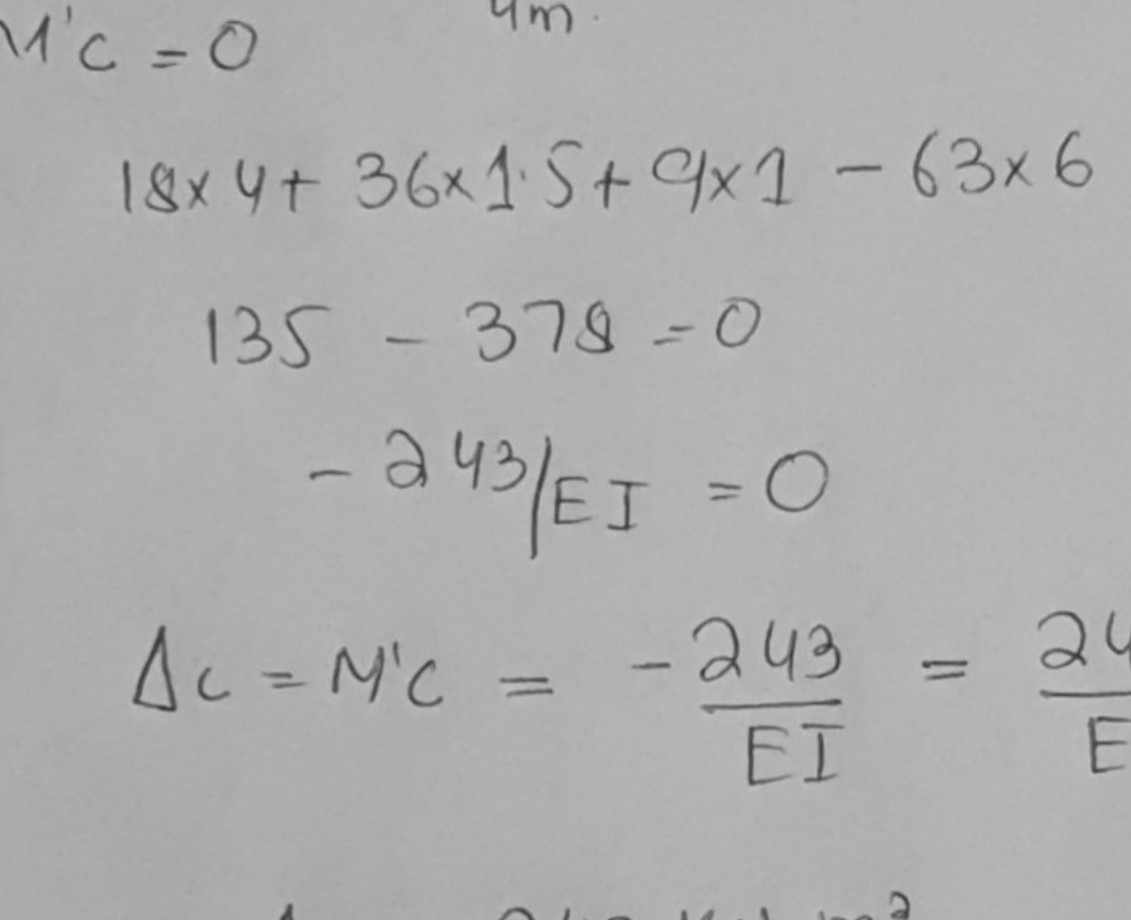
$$\ominus_A = A'_y = 63/EI$$

$$EI = 200 \times 10^9 \, N/m^2 \times 6 \times 10^{-6} \, m^4$$

$$\boxed{EI = 1200 \, KN \cdot m^2}$$

$$\theta_A = A'y = \frac{63}{1200} \Rightarrow 0.0525$$

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



$$\circlearrowright_+ M'_C = 0$$

$$18 \times 4 + 36 \times 1.5 + 9 \times 1 - 63 \times 6$$

$$135 - 378 = 0$$

$$-243/EI = 0$$

$$\Delta_C = M'_C = -\frac{243}{EI} = \frac{243}{EI} \downarrow$$

$$\Delta_C = \frac{243}{1200} \frac{KN \cdot m^3}{KN \cdot m^2}$$

$$\boxed{= 0.20 m}$$