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PAPER :- Structure Analysis

Section :- A

Question No 1 :- Page #1

Write detail note on your own words on different types of loads that different types of structure are designed and support throughout its life Elaborate with examples:

Answer:- Loads:- It is the dimensional requirment for a structure necessary to determine the loads the structure must support.

Types of Loads:- There are different types of loads

1:- Dead Loads:- Dead loads are those that are constant in magnatude and fixed in location throughout the lifetime of the structure. it includes the weight of the structure and any

Permanent material placed on the structure such as roofing, tiles, walls etc. They can be determined with a high degree of accuracy from the dimension of the element and unit weight of the material.

Live loads:- Live loads are those that may very in magnitude and may also change in location. live loads consists cheifly accupancy loads in building and traffic loads in bridges.

Examples:- The floor loading in classroom consists of chairs and laboratory equipment.

Types of Structures:- A combination of members connected together in such a way to serve a useful purpose is called structure.

(1) **Rigid frame:-** its is that type of structure in which members are joined together by regid joints e.g welded joints.

(2) **Truss (pin connected joints)**

A type of structure formed by members in triangular form the resulting figure is called a truss. In truss joints are pin connected and loads are applied at joints. No shear force and bending moment at produced. my axial compression and axial tension is to be determined while analyzing a truss.

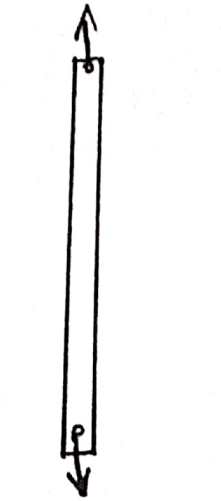
(3) Cables and Arches :- it is the type of structure used to span long distances.

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

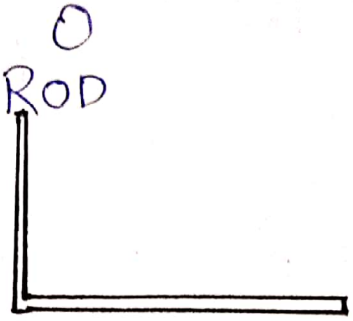
→ Arches achives strength in compression and has a curvature to cable. it must be rigid to maintain its shape. Consists of shear and moment. They are used in bridge structures roofs and openings.

→ Structure Elements :- Some of elements are.

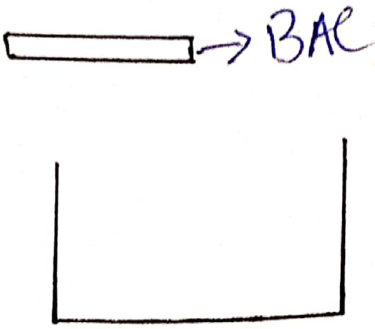
(1) Tie Rods :- Consist of tensile force. These members are bars or rodge.



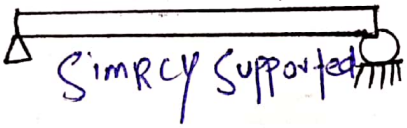
Tie Rod

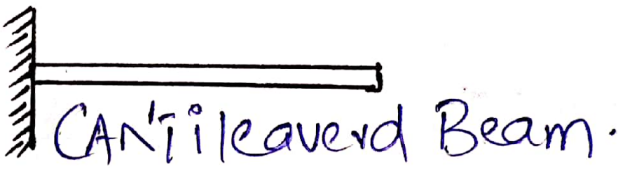


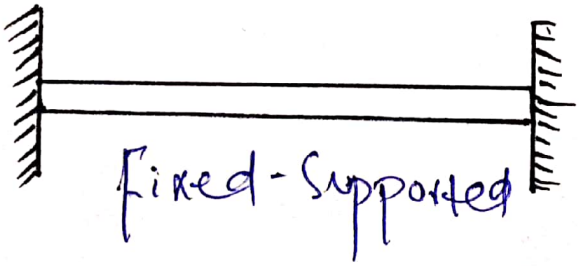
Angles



(2) **Beams:-** Beam is a flexure members of the structure. It is subjected to transverse loading such as vertical loads, and gravity loads. These loads create shear and bending within the beam.



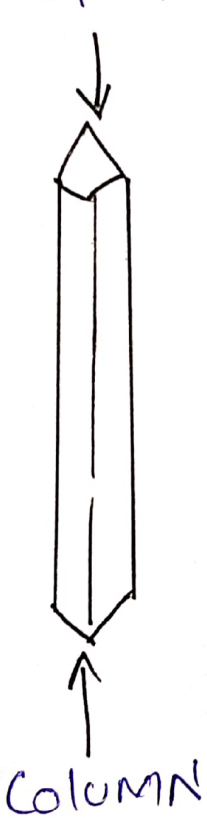




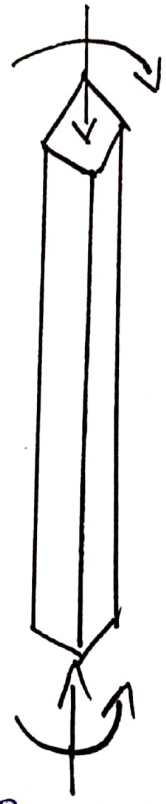
Columns :- They consist of vertical members and resists compressive loads.

Or

one of two or more vertical sections of a printed page separated by a rule or blank space.

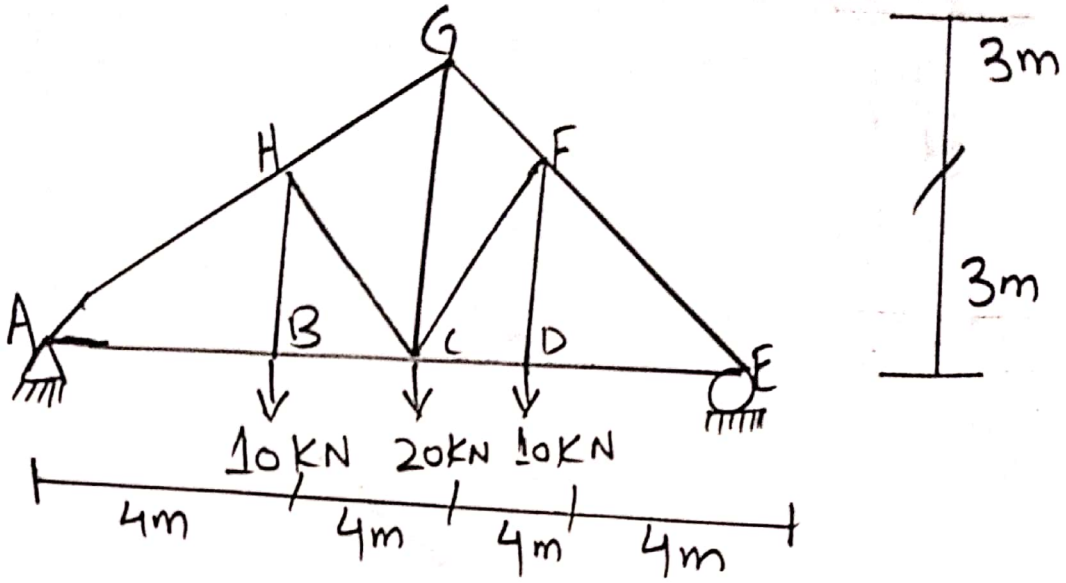


Column



Beam-Column.

Question No 2:-



Forces in each number=?

Solution:- Support reaction

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

$$R_A + R_E = 40 \rightarrow (A)$$

$$\Sigma M_4 = 0 \circlearrowleft -$$

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

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

Now determining force in each number.

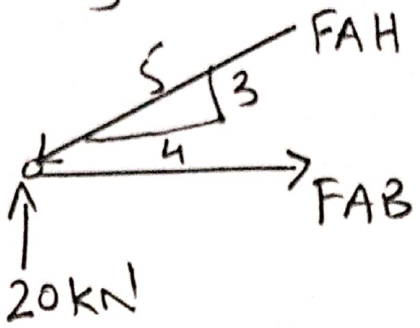
Joint A:- $\Sigma f_y = 0$; $-3/5\,(FAM) + 20KN = 0$

$$= -0.6\,(FAH) = -20\,KN$$

$$F_{AH} = 33.33\ KN$$

PS #8

joints A :-



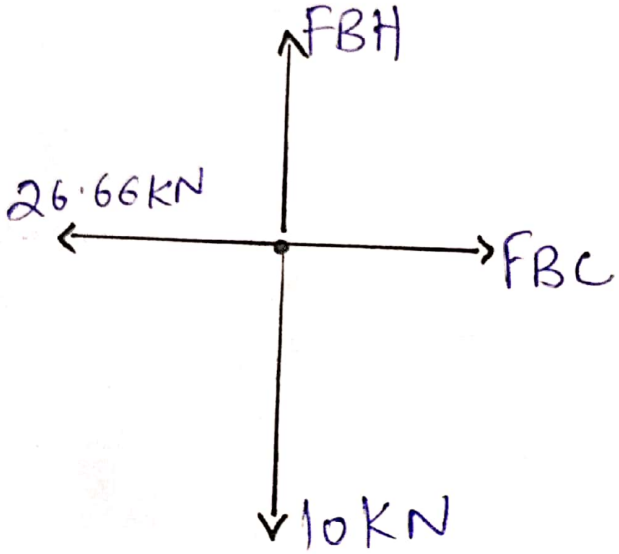
$\Sigma f_x = 0$; $-4/5\,(33.33) + F_{AB} = 0$

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

Joint B :-

$\Sigma f_x = 0$; $F_{BC} = 26.66\ KN\ (T)$

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



joint B :

P8#9

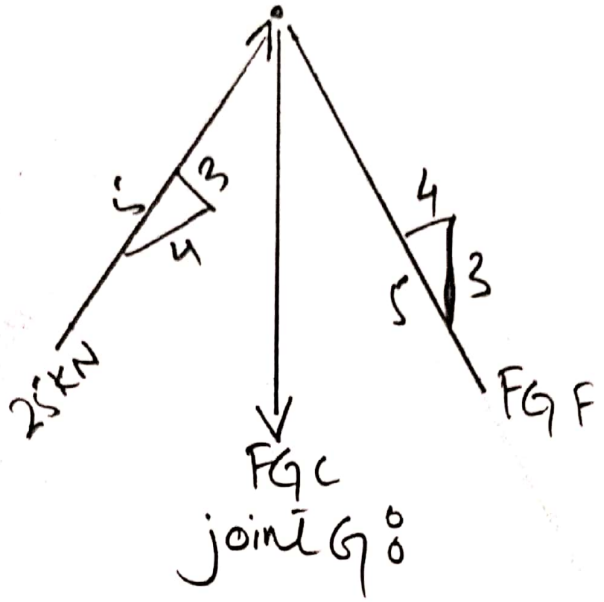
Joint G :-

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

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

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

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



Joint H :-

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

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

PG#10

Solowing eq (1) and eq (2)

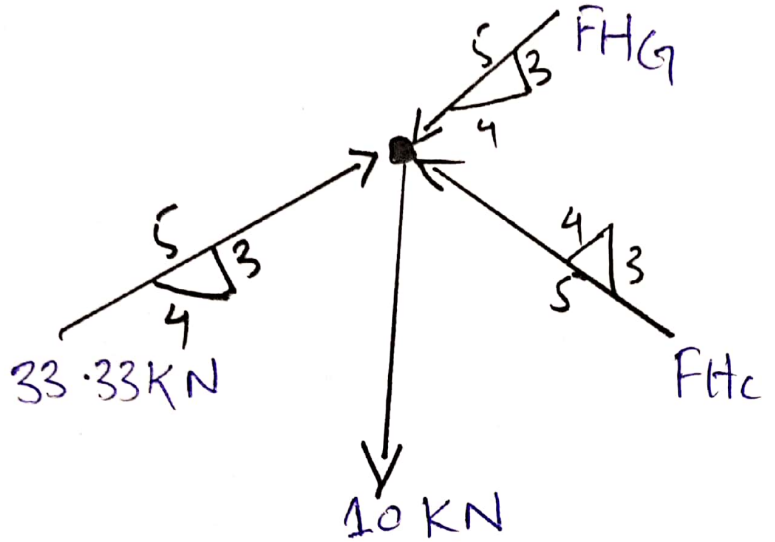
$19.98 - 10 + 0.6\,F_{HC} - 0.6\,F_{HG} = 0 \rightarrow (A)$

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

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

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

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



Joint H

Due to Symmetrical loading and Geometry

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

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

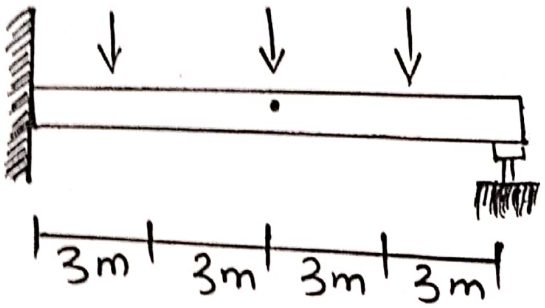
$F_{BM} = F_{DF} = 10KN\ (T)$

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

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

$F_{AH} = F_{CF} = 33.33\,KN\ (C)$

Question No 3



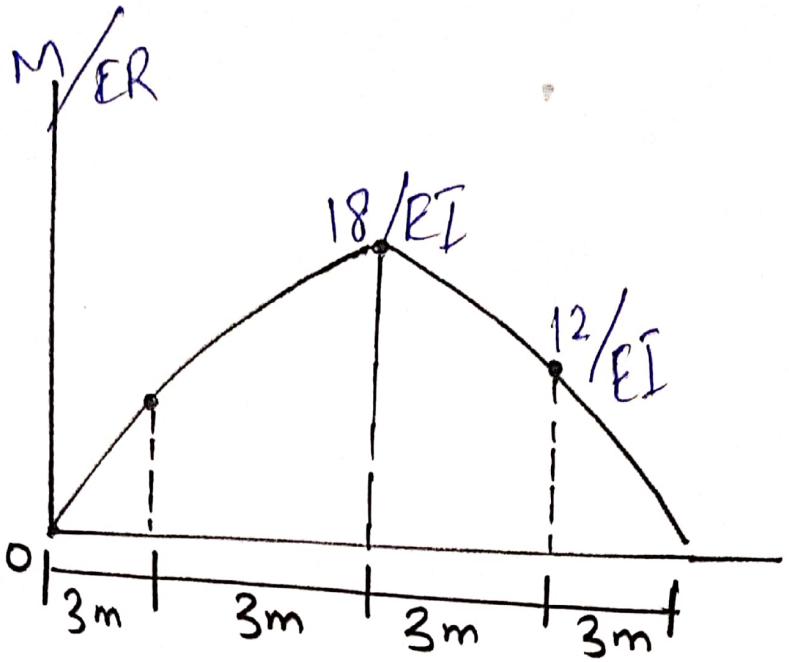
Given: $E = 200\,Gpa$, $I = 6 \times 10^{6}\,mm$

Determine slope at point 'A' and displacement 'C' using moment Area theorm.

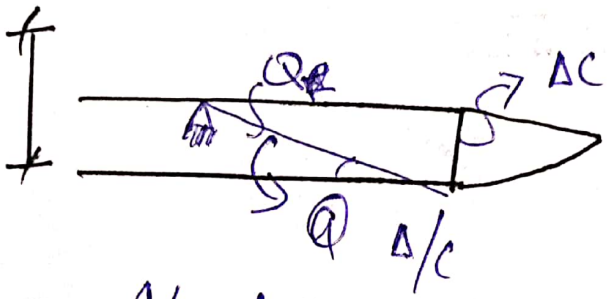
Solution:-

(i) Finding out PM/EI Diagram of elastic curve Moment Digram

P.T.O



* ELASTIC CURVE :-



$$\textcircled{Q}\ \Delta/c = \tfrac{1}{2}(R/EI)(3) + (Q/EI)(3) + \tfrac{1}{2}(6/EI)(3)$$

$$\textcircled{Q}\ \Delta/c = (18/EI) + (36/EI) + (9/EI)$$

$$\textcircled{Q}\ \Delta/c = 63/EI \Rightarrow 63/(200\times10^{6})(6\times10^{6})(1000)^{-4}$$

$$\textcircled{Q}\ \Delta/c = 0.0525 \text{ m}$$

$$\textcircled{Q}\ \Delta\theta = 0.0525 \text{ rad hus.}$$

Q# 13

$$t\,\Delta/c = \left[\tfrac{1}{2}\left(R/EI\right)(3)\right]\left(\tfrac{2}{3}(3)\right) + \left[R/EI\,(3)\right]\left(3 + \tfrac{1}{2}(3)\right) + \left[\tfrac{1}{2}\left(6/EI\right)(3)\right]\left(3 + \tfrac{2}{3}(3)\right)$$

$$\Rightarrow 0.202\ m$$

So $\Delta c = t\,\Delta/c = 0.202m$

$= 202mm$ Ans.

THE END