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Question No 1: ①

write detial note on your own words on different types of Loads that different types of structure are disgned to support throughout is life Elaborate with example?

*LOADS:-

It is dimensional requirement structure necessary to determine the Load structure must support.

*TYPE OF LOADS:-

*Deads Loads

Deads loads are those that are constant in magnitude 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, wall etc. they can be determined with a high degree of accuracy from the dimensions of the element and the unit weight of the material.

*Live Loads:-

Live loads are those that may very in magnitude and may also change in location. Live loads consist chiefly occupancy loads in bulding and traffic loads in bridges. Live loads at any given time are uncertain both in magnitude and distribution

Enivornmental loads:-

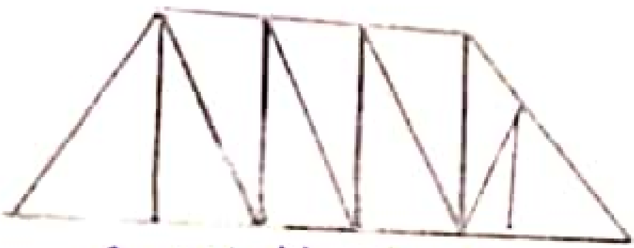
consist mainly of snow loads, wind pressure and suction earthquake loads (initial forces) caused by earthquake motions, Soil pressure or Substance portion or structure loads from possible ponding of rainwater on flat Surface and forced caused by temperature differences like, Live loads environmental loads and given at any given time are uncertain both it magnitued and distrubion.

* Columns :-

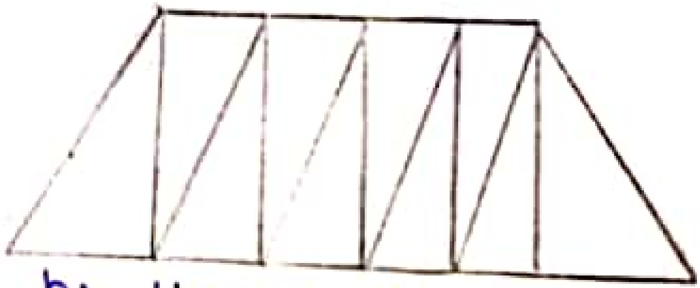
Colums are generally vertical and resit exial compressive loads. Metal buildings usually use wide-flange cross section as columns white concrete building usually use square and circular section with reinforcing bar. Occasionaly columns are subject bending moment. these member are referred to as beam columns.

TYPE OF Structures :-

Trusses. As spans increase the use of beams becomes uneconomical. for moderately long span trusses consist of slender elements connected at their ends (joints) by hinged connection arranged triangular fashion to form a stable configuration. When the loads are applied at the joint. ideals (tressu) trusses are always either in uniform tension cause member elongate or in uniform compression cause member shorten Real trusses although some bending formed in the members. When it is loaded, in most cause such Secondary stressses are small, and the assumption of pure tension and compression are satisfactory. Trusses are commonly used in bridge and roof structu[res]. Based on their shape trusses are classfied into several types show..



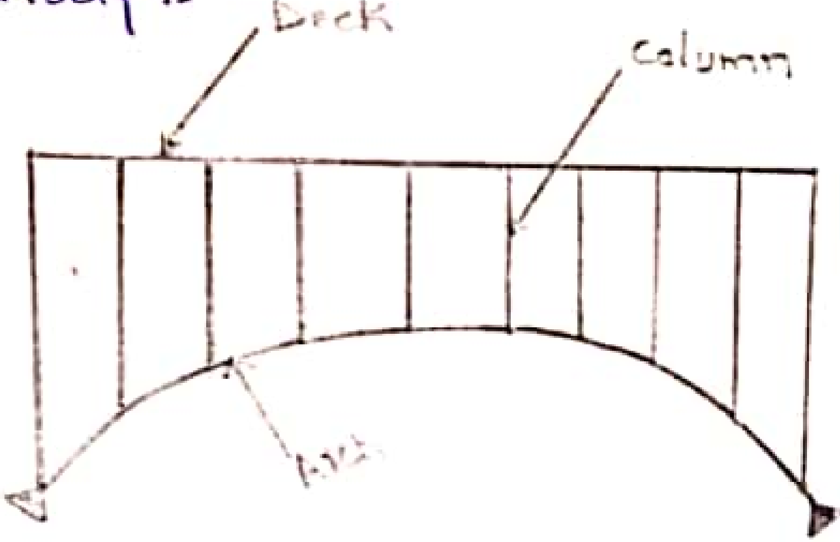
a. pratt Truss



b. Howee Truss

Arches. The use of trusses to support bridge deck becomes for longer than moderate spans. In this situation arches are commonly used fig (4) show an arch in which deck is carried by columns supported in turn. Alternatively the bridge deck may be suspended from the arch by hangers.

Arches carry most of their loads by developing compressive stresses within the arch itself :-

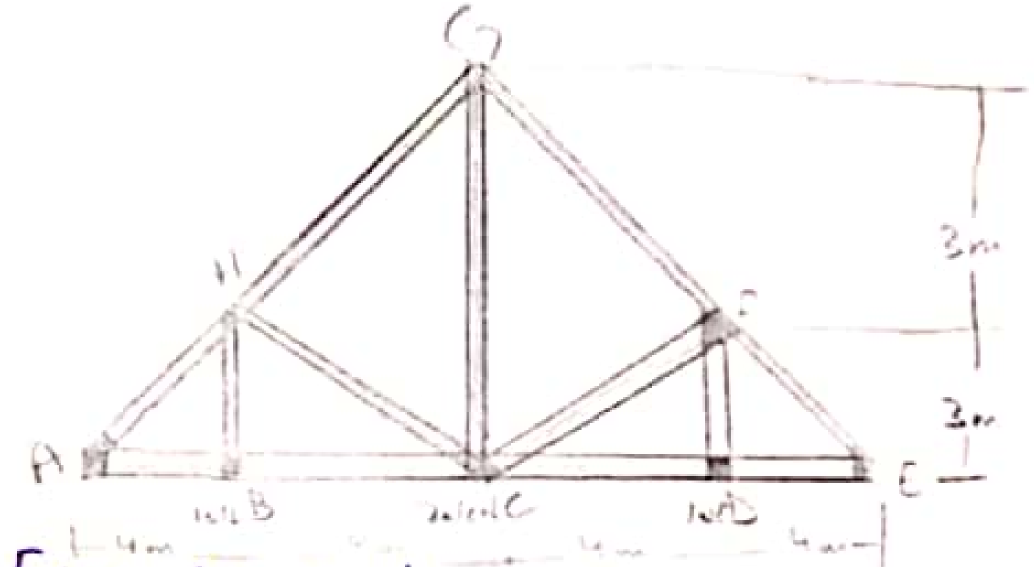


*• Cables :- Others structure then arch to Support long - span bridges are cables. because of their flexibility, cables have negligible bending stiffines and can develop only tension. thus under external loads, a cables adopt a shape then enables it to support the load by tensile force alone in other words the shape of cable change as loads acting it change one of the popular cable structure is suspension bridge . it suspension. In wand the roadway from two main cables by means of vertical hangers.

* Frames :-

Frames are composed of beams and columns that are either rigid (moment-resisting) connection or by hinged connection to form stable configuration. Unlike trusses which are subject only to joint side loads the external loads on frames may be applied on the members as well as on the joint. the member of frame subjected to bending moment shear axial (compression or tension) torsion (for space trusses) under the action of external loads structural steel and reinforced concrete frames are commonly used in multistory buliding and industrial plants. Example shape of frame show.

① Question No 2:-



Forces in each number

Sol:-

Support reaction

$\Sigma F_y = 0 \uparrow\downarrow$

$R_+ + R = 40 \longrightarrow$

$\Sigma M_4 = 0$

$R_{(5)}(16) + 10(12) + 20(8) + 10(4) = 0$

$R_5 = 320/16 = 20\,kN$

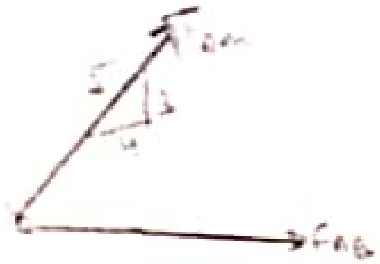
Now determining force in each number

② Joint A:-

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

$= \; -0.6 \, (F_{AH}) = -20 \, KN$

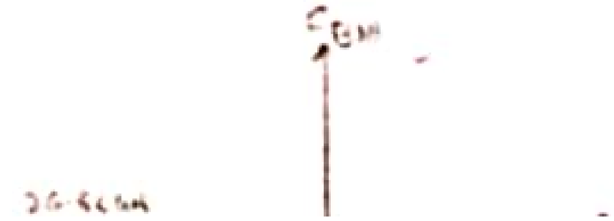
$F_{AN} = 33.33 \, KN \, (C)$



Joint B:-

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

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



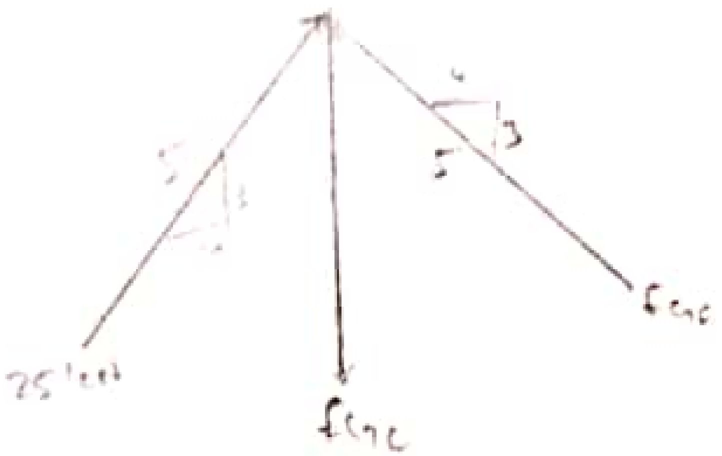
③ Joint G:-

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

F_{GC} 25KN (c)

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

$F_{GC} = 3KN$ (c).



④ Joint H:-

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

$-3/5\,(AHG)$ ⟶ *

$\Sigma fx = 0;\ 4/5\,(33.33KN) - 4/5\,(FHC) - 4/5\,(F_{HG})$ — Ⓑ

coming eq ① & ②

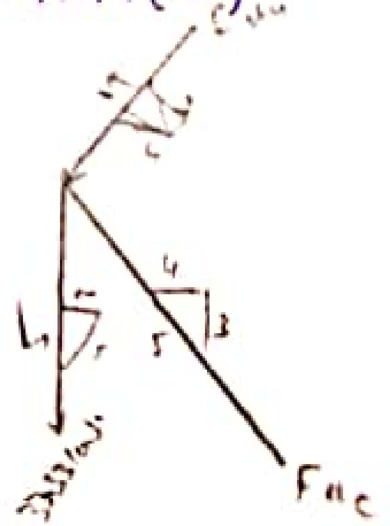
$19.98 - 10 + 0.6\,FH_c - 0.6\,F_{HG} = 0$ —— ④

$26.66 - 0.8\,FH_c - 0.8 = 0$ —— Ⓑ

Multpling eq A by 1.34 and then add with eq Ⓑ we get

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

$FH_c = 8.34KN\ (c)$



(5) Due to symmetrical loading & Geometry

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

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

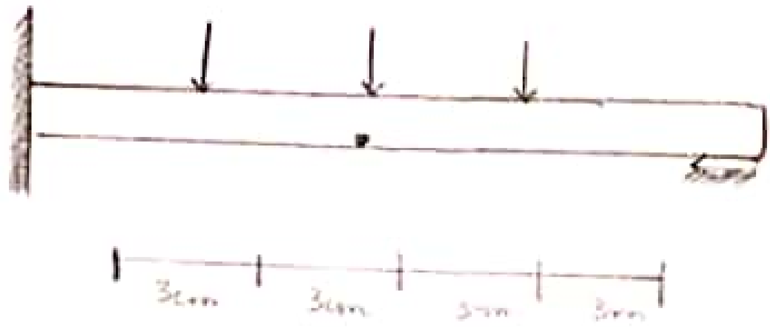
$F_{BH} = F_{DE} = 10 KN (T)$

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

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

$F_{AH} = F_{FC} = 33.33 KN (C)$

Question No 3:-

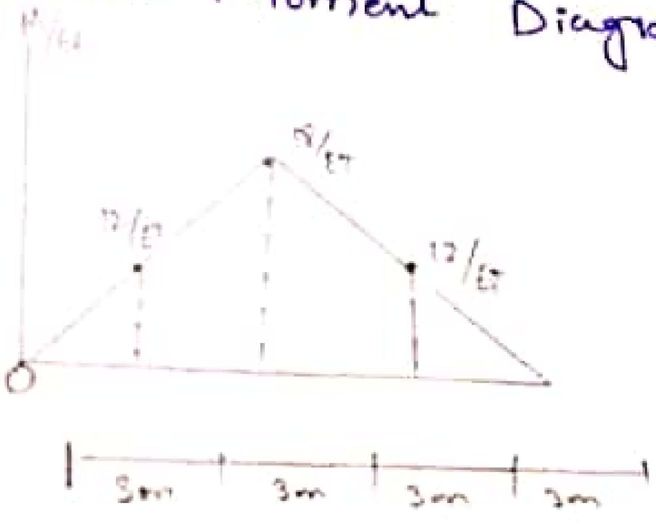


Given: E 200GPm, I = 6×10⁶ mm

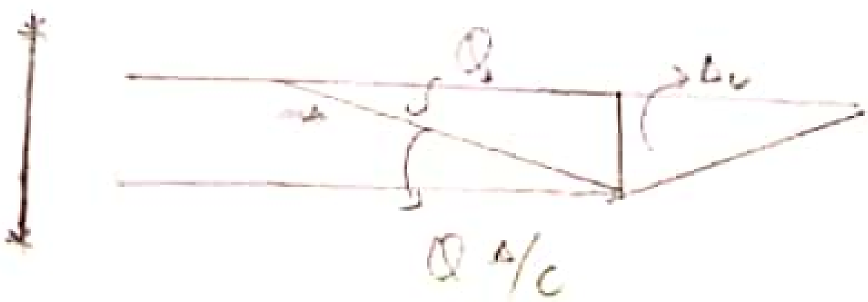
Determine slope at point 'b' and displacement at 'c' using Moment Area theorm.

Solution:-

(i) Finding out M/EI Diagrame of elastic curve Moment Diagram:.



Elastic curve:



$$Q\, \gamma/c = \tfrac{1}{2}\left(\tfrac{12}{EI}\right)(3) + \left(\tfrac{12}{EI}\right) + \tfrac{1}{2}\left(\tfrac{6}{EI}\right)(3)$$

$$Q = \lambda/c = \left(\tfrac{18}{EI}\right) + \left(\tfrac{36}{EI}\right) + \left(\tfrac{9}{EI}\right)$$

$$Q = \lambda/c = \tfrac{63}{EI} \Longrightarrow \tfrac{63}{(200\times10^{6})(6\times10^{6})(1000)^{-4}}$$

$$Q\, \lambda/c = 0.0525\,\text{rad}$$

$$Q_A = 0.0525\,\text{rad Ans}$$

$$t\, \lambda/c = \left[\tfrac{1}{2}\left(\tfrac{12}{EI}\right)(3)\right]\left[\tfrac{2}{2}(3)\right] + \left[\tfrac{12}{EI}(3)\right]$$

$$\left(3 + \tfrac{1}{2}(3)\right) + \left[\tfrac{1}{2}\left(\tfrac{6}{EI}\right)(3)\right]$$

$$\left[\left(3 + \tfrac{2}{3}(3)\right)\right.$$

$$= 0.202\text{m}$$

So

$$J_c = t_{c/c} = 0.202\text{m}$$

$$= 202\text{mm Ans;}$$

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