I.D = 7493
Subject = Structure Analysis-1
Submitted to = Engr. Amjad Islam

Answer#01

Types of Loads :=>

(i) **Live Load:-**
This is the movable, temporary and transferable load on the Floor and hece it is variable. In a building the weight of inhabitans, Furniture or any other stored material is the live load for that building.

Example:- Chair, table, Tv etc.

(ii) **Dead Load** = It is permanant, immovable and untransable load of a structure. This is the load of the material used for the various components of a building such as wall, Floor, roofs and water tank.

(iii) **Wind Load** = Tall building are subjected to wind Pressure on their exposed face and inclined or slopy roof surface. The effect of wind pressure is to reduce the pressure of the foundation on

the wind ward side and to increase the pressure on the foundation on the leeward side.

(iv) Snow load:-

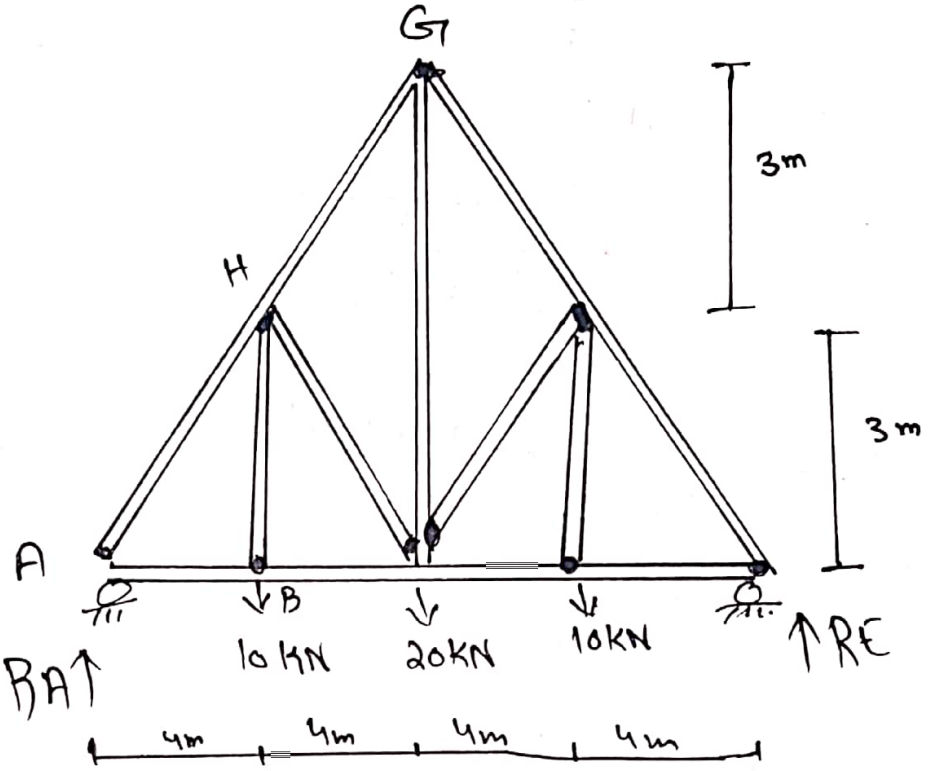
Snow load constitute to the vertical load in the building but these types of load are considered only in snow

e.g:- Snow load on roof building.

(v) Earthquake Load:-

The vertical and horizontal Forces on the building. The total vibration caused by earthquake may be resolved into three mutually perpendicular direction. The movement in vertical direction do not cause force in super structure to any significant extent.

Answer #02



Solution:

$$j = 8$$
$$m = 3$$
$$r = 3$$

$$S.I = m + r - 2$$
$$= 13 + 3 - (2)(8)$$
$$= \boxed{16 - 16 = 0} \rightarrow \text{Statically determinate}$$

Support Reaction

$$\Sigma F_y = \uparrow + \downarrow$$
$$R_A + R_E - 10 - 10 - 20 = 0$$
$$R_A + R_E = 40 \quad \text{——(i)}$$

$\Sigma M_A = 0$ ↺ +ve ↻ -ive

$(10\times4) + (20\times8) + (10\times12) - RE\times16 = 0$

$16RE = -320$

$RE = 20$ — (i)

Eq (i) put in eq (ii)

$RA + 20 = 40$

$\boxed{RA = 20}$

Force by Joint Method

Joint A

$\tan\theta = 3/4$

$\theta = \tan^{-1} 3/4$

$\theta = 36.86$

$\Sigma F_Y = 0$ ↑ +ve

$FAH \sin\theta + 20 = 0$

$FAH \sin(36.86) = -20$

$\boxed{FAH = 33.34} \rightarrow$ (Compression)

$\Sigma F_X = 0$ → + ← −

$FAB + FAH \cos(36.86) = 0$

$\boxed{FAB = 26.67 KN} \rightarrow$ (Tension).

Joint B :-

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

$F_{BH} - 10 = 0$

$\boxed{F_{BH} = 10\ KN}$ → (Tension)

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

$F_{BC} - F_{AB} = 0$

$F_{BC} - 26.67 = 0$

$\boxed{F_{BC} = 2.667}$ → (Tension)

Joint "E"

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

$F_{EF} \sin(36.86) + 20$

$\boxed{F_{EF} = 33.3KN}$ → (Compression)

$\Sigma F_x = \rightarrow + \leftarrow -$

$F_{DE} + F_{EF} \cos(36.86) = 0$

$\boxed{F_{DE} = 26.67}$ → Tension

Joint "D"

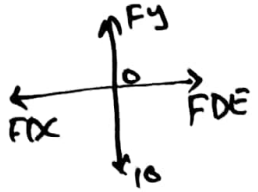
$\Sigma F_y = 0 \uparrow + \downarrow -$

$\boxed{F_{DE} = 10KN}$ → Tension

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

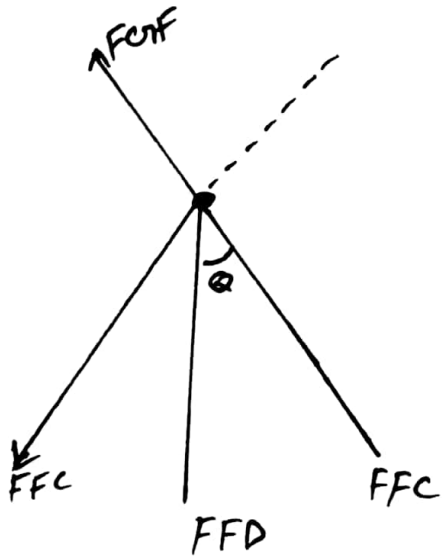
$- F_{DC} - F_{DE}$

$\boxed{F_{DC} = 26.67}$ → Tension



Joint F

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



$\because \tan\theta = 4/3$

$\theta = \tan^{-1} 4/3$

$\boxed{\theta = 53.13^\circ}$

$F_{FC} + F_{FD}\sin(53.13)$

$F_{FC} + (10)\sin(53.13) = 0$

$F_{FC} = -7.99$

$\boxed{F_{FC} = 7.99\,KN}$ → compression

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

$F_{EF} + F_{FD}\cos(53.13) - F_{GF} = 0$

$-33.34 + (10)\cos(53.13) - F_{GF} = 0$

$-27.34 = F_{GF}$

$F_{GF} = -27.34$

so $\boxed{F_{GF} = 27.34\,KN}$ → Compression

Joint H

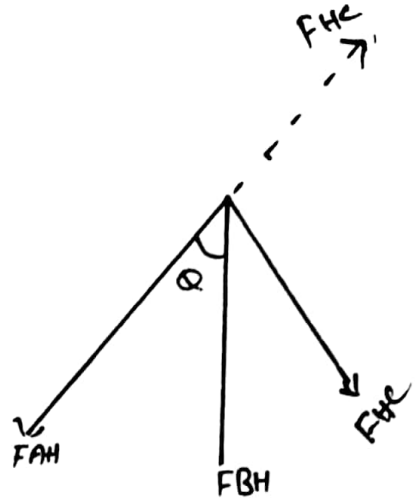
$\Sigma F_x = 0 \quad \rightarrow + \leftarrow$

$F_{HC} + F_{BH} \sin(53.8) = 0$

$F_{HC} + 10 \sin(53.13) = 0$

$F_{HC} + 10 \sin(53.13 = 0$

$\boxed{F_{HC} = -7.99 \text{KN}}$ → compression



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

$F_{AH} + F_{BH} \cos(53.13) - F_{HG} = 0$

$-33.34 + 10 \times \cos(53.13 = F_{HG}$

$F_{HG} = -27.34$

$\boxed{F_{HG} = 27.34}$ → compression

Joint C

$\tan Q = 3/4$

$\boxed{Q = 36.86}$

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

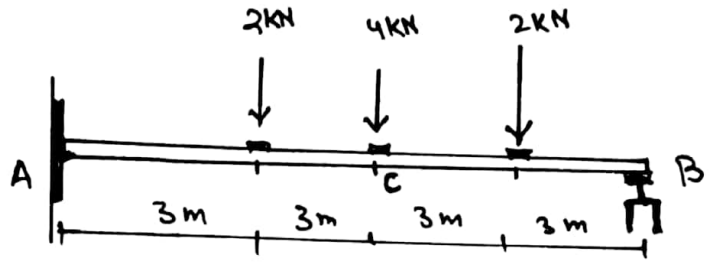
$F_{CG} + F_{CH} \sin(36.86) + F_{CF} \sin(36.86) - 20 = 0$

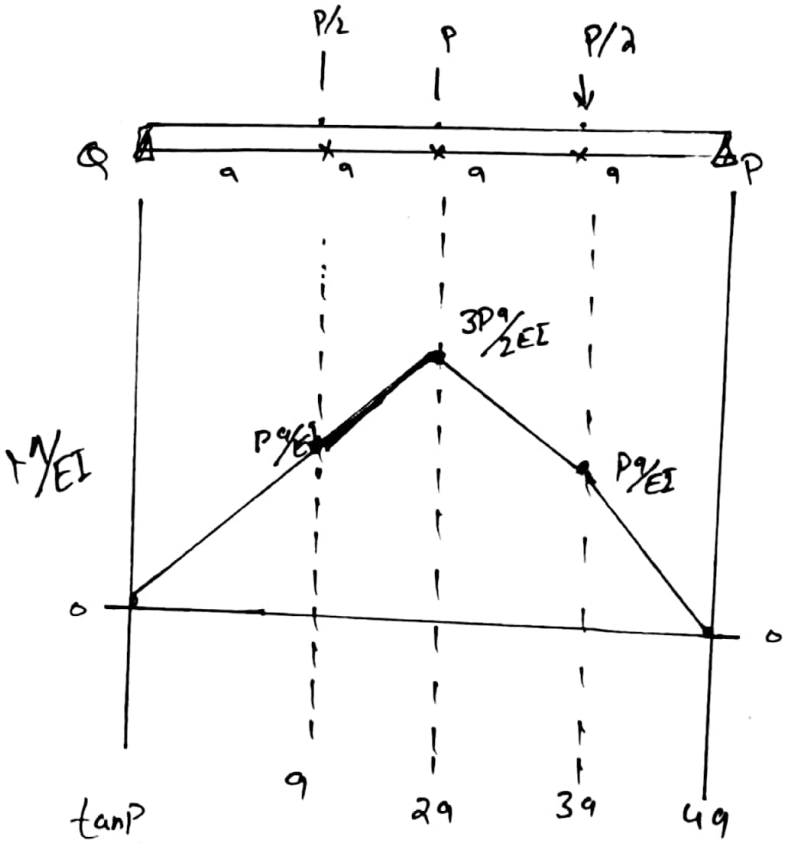
$F_{CG} - 7.99 \sin(36.86) - 7.99 \sin(36.86) - 20 = 0$

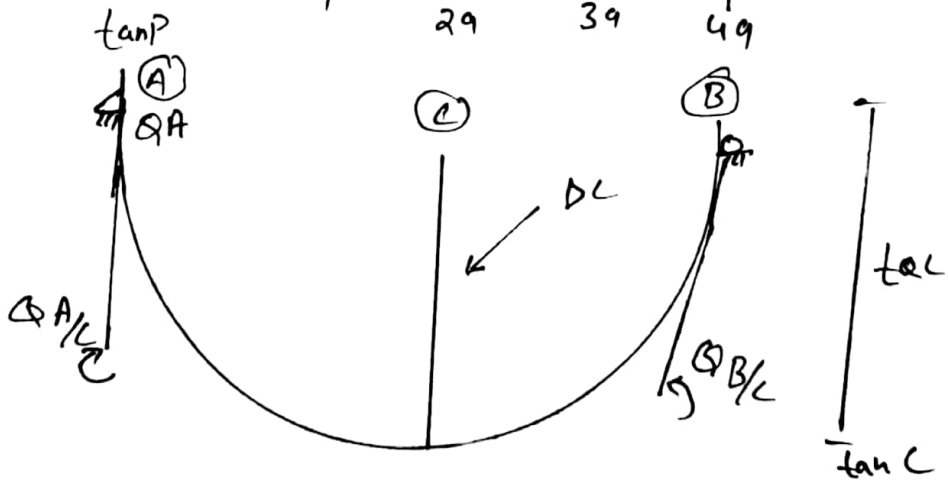
$\boxed{F_{CG} = 27.58 \text{ KN}}$ → Tension

Answer#3

Solution:-







$$\theta A/C = \frac{1}{2}\left(\frac{Pa}{EI}\right) + \left(\frac{Pa}{EI}\right)(a) + \frac{1}{2}\left(\frac{Pa}{2EI}\right)(a) = \frac{7Pa^2}{4EI}$$

$$A/C = \left[\frac{1}{2}\left(\frac{Pa}{EI}\right)a\right]\left[\frac{2}{3}a\right] + \left[\frac{Pa}{EI}(a)\right]\left[a+\frac{1}{2}a\right] + \left[\frac{1}{2}\left(\frac{Pa}{2EI}\right)a\right]\left[a+\frac{2}{3}a\right] = \frac{9Pa^3}{4EI}$$

$$\because \theta A = \theta A/C = \frac{7Pa^2}{4EI} \quad \text{—(i)}$$

$$D_C = t A/C = \frac{9Pa^3}{4EI} \quad \text{—(ii)}$$

Here $P = 4KN$

Now eqn (i)

$$\theta A = \frac{7(4)^2(3)^2}{4\times200\times10^9\times6\times10^{-6}}$$

$$= \boxed{2.1\times10^{-4}} \text{ rad}$$

Now eqn (ii)

$$\Delta_C = \frac{9(4)(3)^3}{4\times200\times10^9\times6\times10^{-6}}$$

$$= \boxed{2.025\times10^{-4}} \text{ m}$$