Usama Khurshid

7983

Section B

Structural Analysis.

Load:

The type of loads acting on structures for building and other structures can be broadly classified as vertical loads, horizental loads and logitudinal loads. The vertical loads consist of dead load, live load and impact load. The horizental loads comprises of wind load and earthquake load.

Types of Loads:

Dead load
Live load
Wind load.
Snow load.
special load.

ve load:

Live load include any
mporary or transient forces that
ct on building or structural element.
ypically they include People, furniture
nd almost everything that can
be moved.

Dead load:

are static forces that are relatively constant for an extended time. They can be in tension or compression.

Types of structure:

shell structure.
Frame structure.
Solid structure.

Shell structure:

is a type of structural element which is characterized by its geometry, being a three-dimensional solid whose thickness is very small when compared with other dimensions, and in structural term.

Frame structure:

is a structure having the combination of beams, column and slab to resist the lateral and gravity load.

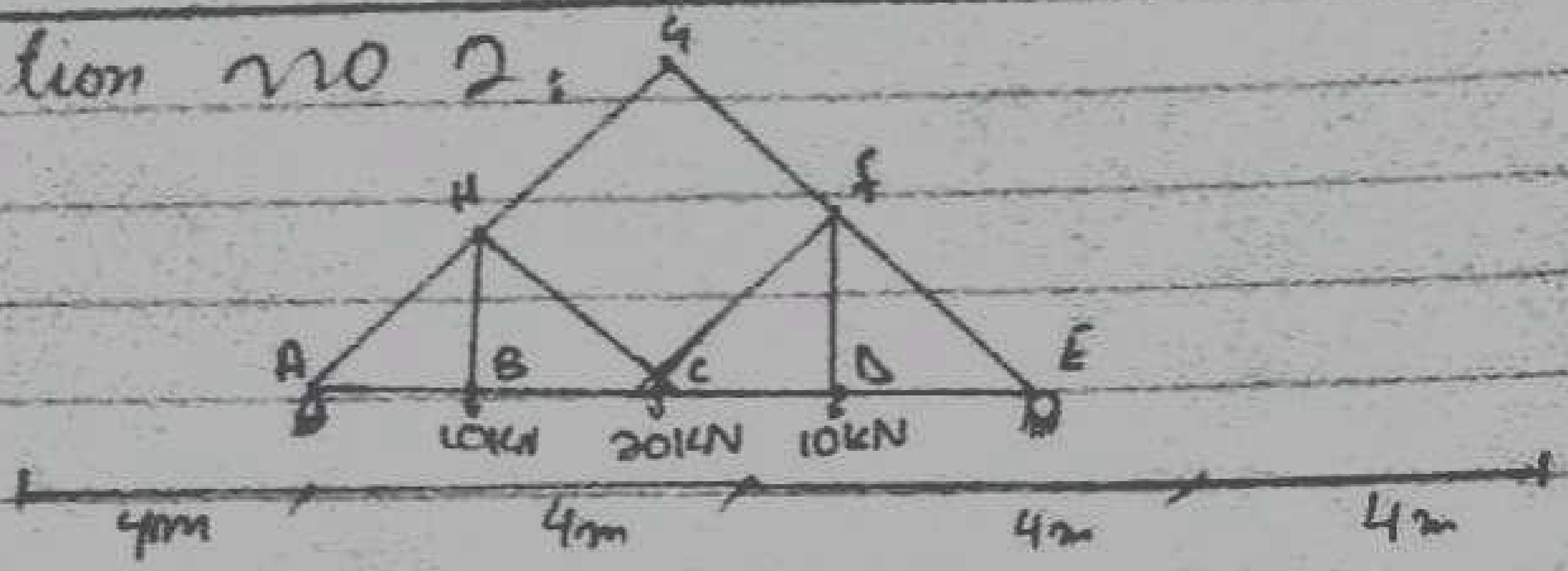
Solid structure:

A solid structure uses construction materials to support loads. A solid structure usually has a large mass. A well-made solid structure can last a long time.

Structural elements:

The basic components of a building structure are foundations, floors, walls, beams, columns, roof, stair etc. These elements serve the Purpose of supporting, enclosing and protecting the building structure.

Question no 2:



forces in each member =?

Solution:

Support reactions :

$\Sigma f_y = 0 \quad \uparrow^+ \downarrow$

$R_A + R_E = 40$ ——— (A)

$\Sigma M_A = 0 \circlearrowleft +$

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

$R_E = 320/16 = 20KN$

$R_{ext} = 40 - 20 \Rightarrow R_A = 20KN.$

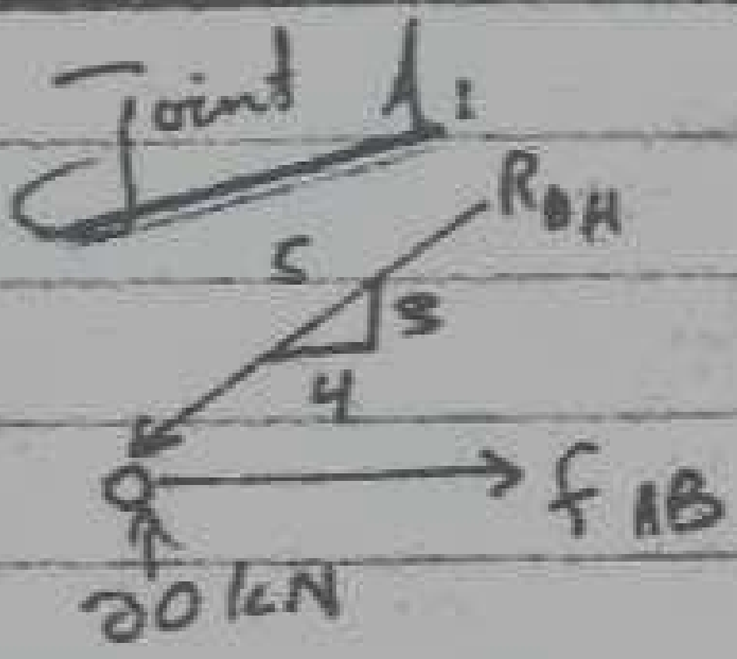
Now determining force in each member.

Joint A :

$\Sigma f_y = 0 ; -\frac{3}{5}(f_{AH}) + 20KN = 0$

$= -0.6(f_{AH}) = -20KN.$

$f_{AH} = 33.33KN \ (c)$



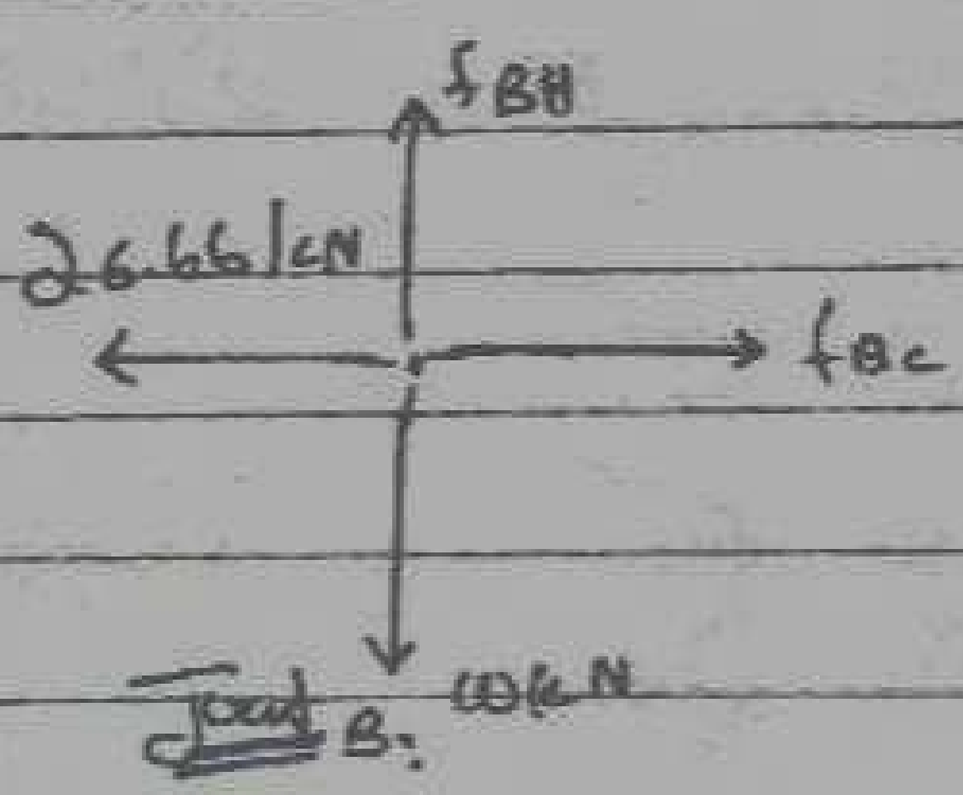
$\Sigma f_x = 0; \quad -\frac{4}{5}(33.33) + f_{AB} = 0$

$\Rightarrow f_{AB} = 26.66 kN \ (T)$

Joint B:

$\Sigma f_x = 0; \quad f_{BC} = 26.66 kN \ (T)$

$\Sigma f_y = 0; \quad f_{BH} = 20 kN \ (T)$



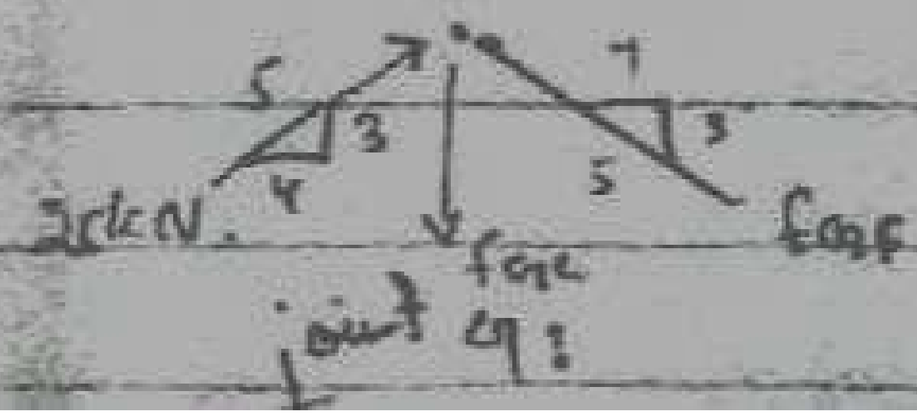
Joint q:

$\Sigma f_x = 0; \quad \frac{4}{5}(25) - \frac{4}{5}(f_{qH}) = 0$

$f_{qH} = 25 kN \ (c)$

$\Sigma f_y = 0; \quad \frac{3}{5}(25) + \frac{3}{5}(25) - f_{qc} = 0$

$f_{qc} = 30 kN \ (c)$



Joint H:

$\Sigma f_y = 0 \; ; \frac{3}{5}(33.33) - 10kN + \frac{3}{5}(f_{HC}) \frac{3}{5}$ (H+

$\Sigma f_y = 0 : \frac{4}{5}(33.33kN) - \frac{4}{5}(f_{HC}) - \frac{4}{5}(f_{HG})$ — (B)

Solving eq (1) & eq (2)

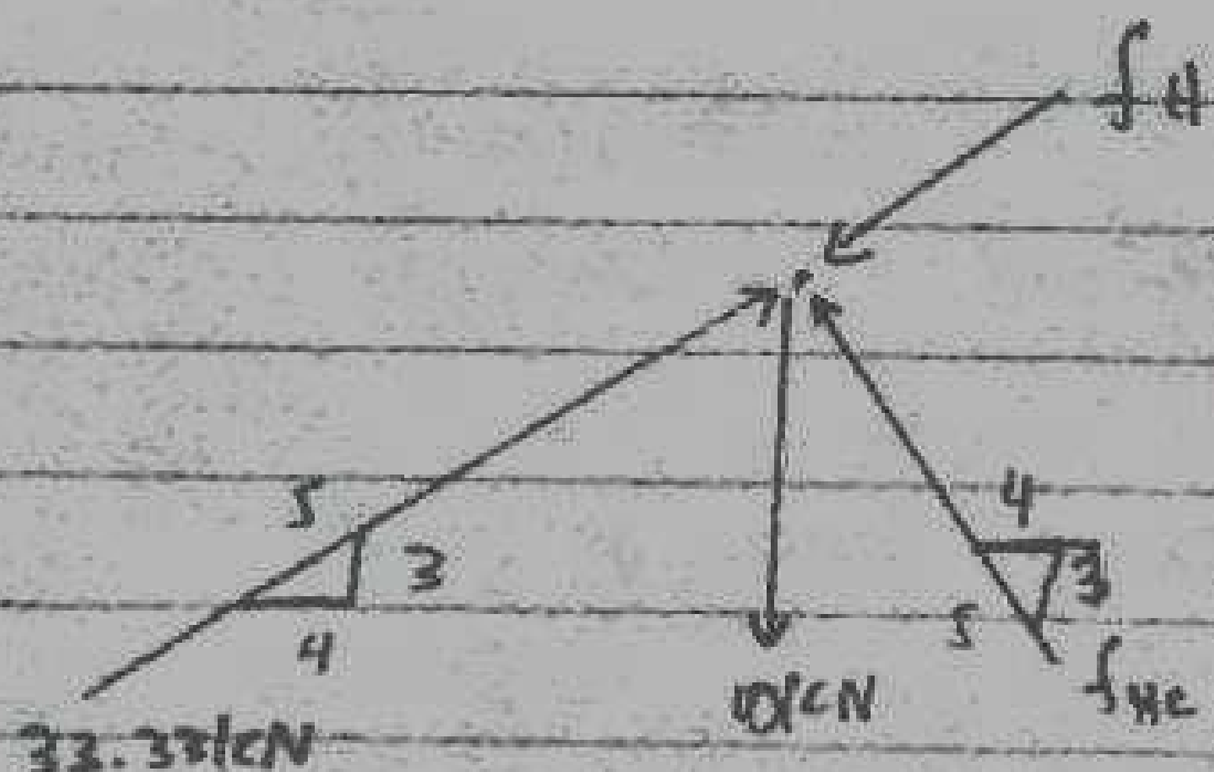
$19.98 - 10 + 0.6 f_{HC} - 0.6 f_{HG} = 0$ — (A)

$26.66 - 0.8 f_{HC} - 0.8 f_{HG} = 0$ — (B)

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

$f_{HG} = 25kN$ (C).

$f_{HC} = 8.34kN$ (C)



Joint H:

Due to symmetrical loading & Geometry

$f_{AB} = f_{BD} = 26.66\ KN\ (T)$

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

$f_{BG} = f_{DF} = 10KN\ (T)$

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

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

$f_{AH} = f_{HF} = 33.33\ KN\ (C)$

Question No 3:

Given. E= 200Gpa, I = 6×10^6 mm⁻

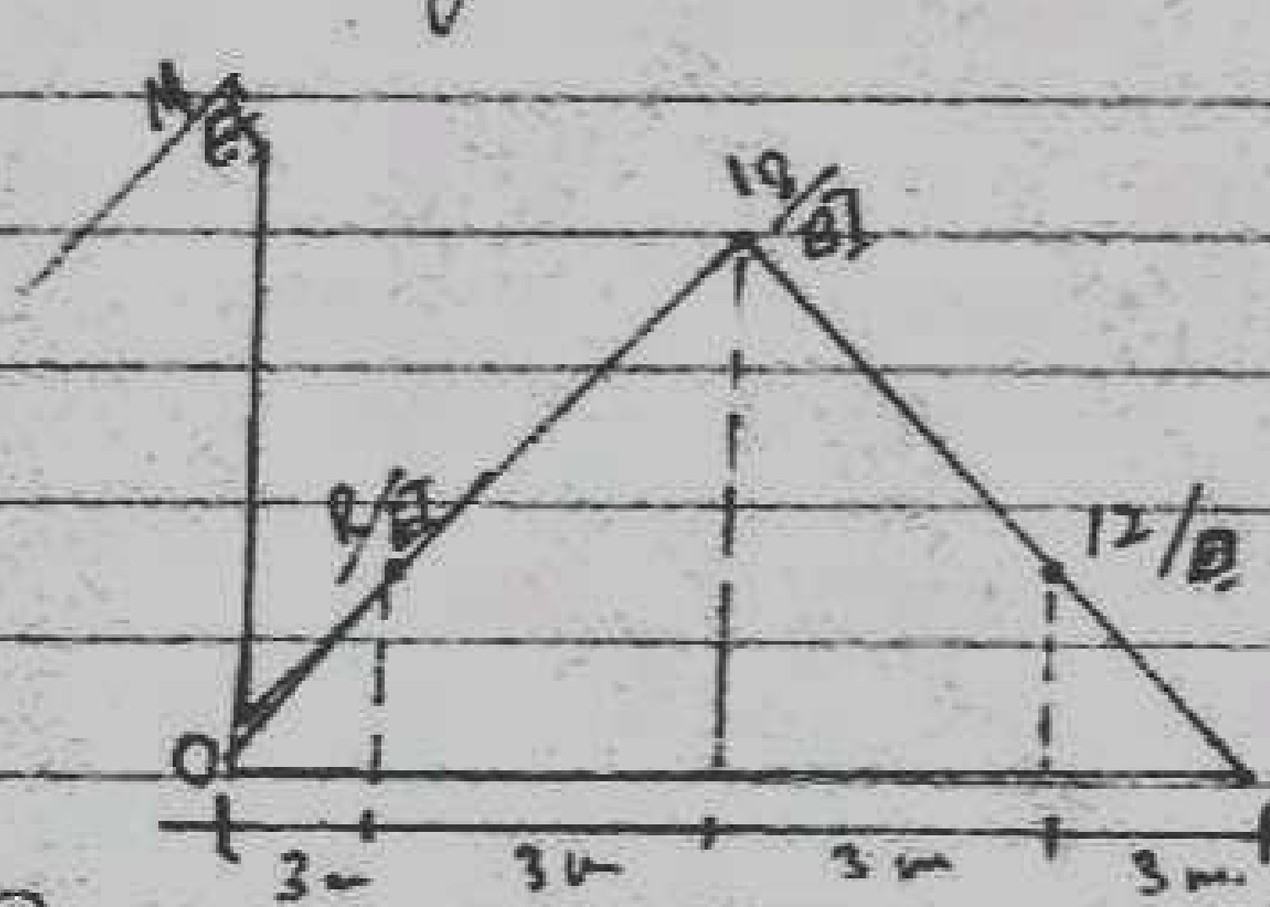
Determine slope at point 'b' and displacement at 'c'

Using Moment Area theorm.

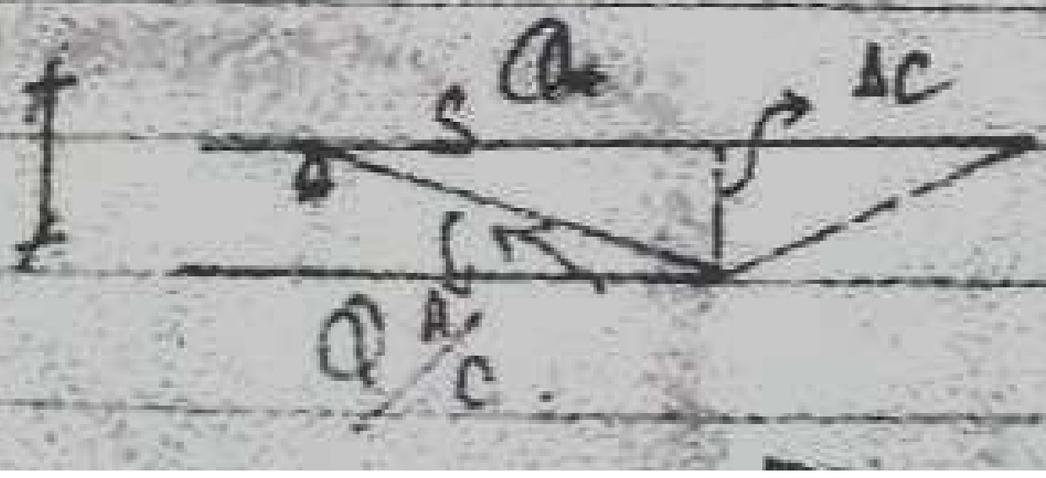
Solution:

finding out M/EI Diagram & elastic curve.

Moment Diagram:



Elastic Curve:



$$\theta_{A/C} = \frac{1}{2}\left(\frac{9}{EI}\right)(3) + \left(\frac{9}{EI}\right)(3) + \frac{1}{2}\left(\frac{6}{EI}\right)(3)$$

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

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

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

$$\theta_A = 0.0525 \text{ rad hus.}$$

$$t_{A/C} = \left[\frac{1}{2}\left(\frac{18}{EI}\right)(3)\right]\left(\frac{2}{3}(3)\right) + \left[\frac{12}{EI}(3)\right]\left(3+\frac{1}{2}(3)\right) + \left[\frac{1}{2}\left(\frac{6}{EI}\right)(3)\right]\left(2+\frac{2}{3}(3)\right)$$

$$= 0.202 \text{ m}$$

so

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

$$= \boxed{202 \text{ mm}}.$$

Answer.