Exam Mid Term

ID 7964

Subject Structuse Analysis

Date 19/04/2020

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Answer No 1

Solution:

Support reactions:

$\Sigma f_y = 0$ (+↑ ↓)

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

$\Sigma M_A = 0$ (↻ +)

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

$RE = \frac{320}{16} = 20KN$

$R_S = 40 - 20$

$R_A = 20KN$

Now determining force in each number:

Joint A:

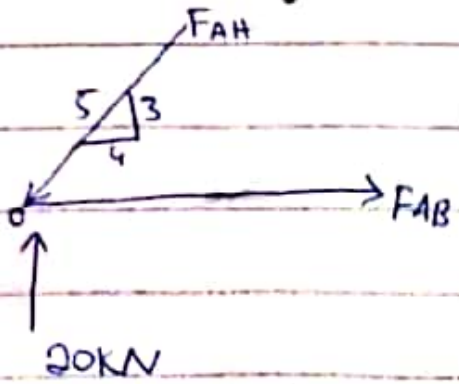
$\Sigma f_y = 0; \; -\frac{3}{5}(FAH) + 20KN = 0$

$= -0.6(FAH)$

$= -20KN$

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

Joint A diagram:



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

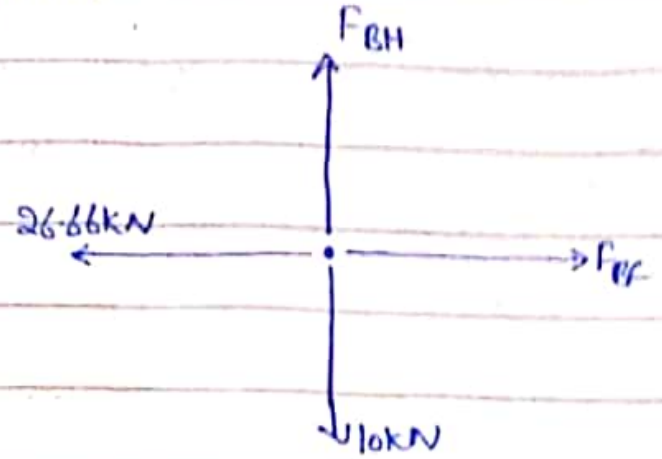
$F_{AB} = 26.66KN(T)$

Joint B:

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

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

Diagram:



Joint G:

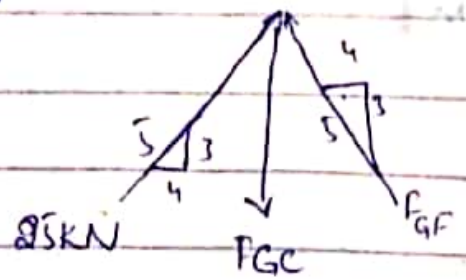
$\Sigma f_x = 0$; $\frac{4}{5}(25) - \frac{4}{5}(F_{GF}) = 0$

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

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

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

Diagram:



Joint H:

$\Sigma f_y = 0$; $\frac{3}{5}(33.33) - 10KN + \frac{3}{5}(F_{HC}) - \frac{3}{5}(F_{HG})$ — (A)

$\Sigma F_x = 0; \frac{4}{5}(33.33KN) - \frac{4}{5}(F_{HC}) - \frac{4}{5}(F_{HG})$ ——— (B)

Solving eq (1) & eq (2)

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

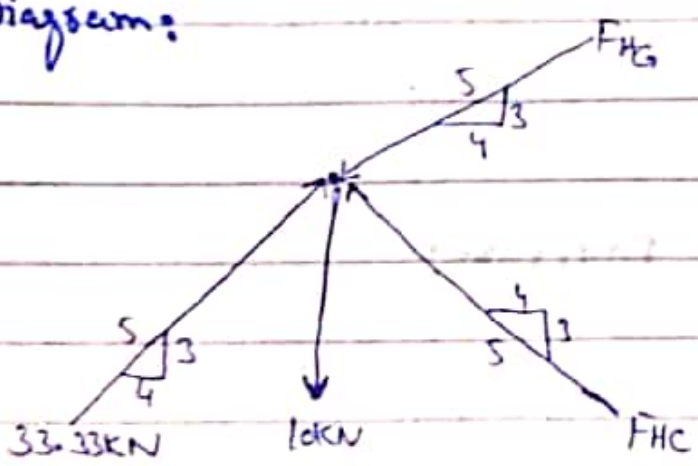
$26.66 - 0.8F_{HC} - 0.8F_{HG} = 0$ ——— (B)

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

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

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

Diagram:



Due do Symmetrical loading and Geometry:

$F_{HB} = F_{BD} = 26.66KN\ (T)$.

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

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

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

$F_{HG} = F_{FG} = 8.34KN\ (C)$.

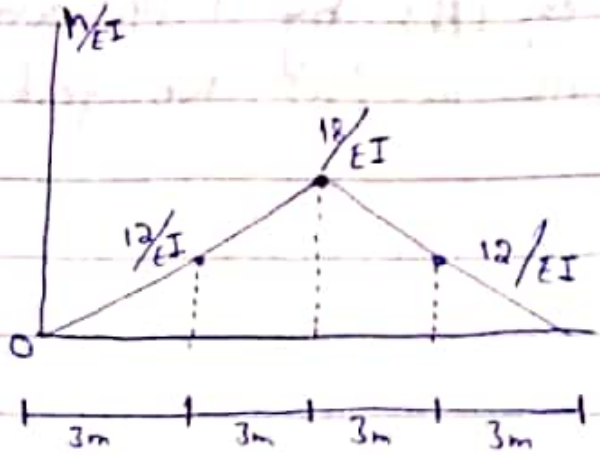
$F_{AH} = F_{CF} = 33.33KN\ (C)$.

Answer No 2:

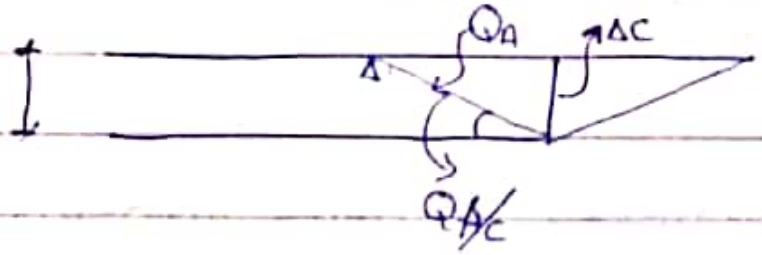
Solution:

1) Finding out M/EI Diagram and elastic Curve

Moment Diagram:



Elastic Curve Diagram:



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

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

$$Q_{A/C} = \frac{63}{EI}$$

$$= \frac{63}{(200\times10^6)(6\times10^6)(1000)^{-4}} \rightarrow$$

$Q_{A/C} = 0.0525$ rad.

$Q_A = 0.0525$ rad Ans.

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

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

$= 0.202$ m

So,

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

$= 202$mm Ans

Answer No 3:

Loads:

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

Types of Loads:

There are different types of loads which are given below:

1) Dead Loads:

It consist of structural members that are permanently attached to structure. Dead load includes the weight by columns, beams, girders, electrical fixtures and other attachments.

2) Live Loads:

Live loads can vary both in their magnitude and location. Those loads are caused by weights of temporarily objects, moving vehicles, natural forces. Consist of additional protection against excess deflection and overload.

Examples:

The line force loading in classroom consists of disks, chairs and laboratory equipment.

Types of Structures:

The combination of structural elements and the material which functions as a structural system. Each system consists of one or more of four types of structures.

Different types of structures are given below:

1) Trusses:

Trusses consists of stacked elements in Triangular form. Due to geometric arrangements of its members loads are converted into Tensile or Compressive forces in members.

- Planar Trusses are composed of members, lies in same plane and used for bridges and roof support.
- Space trusses are composed of members extending in three dimensions and used for trusses.

2) Cables and Arches:

It is the type of structures used to span long distance.

Cables:

Cables are flexible and carry loads in tensions. they are commonly used to support bridges, roofs.

Arches:

Arches achives Strength in

Compression and has a curvature to cable. It must be rigid moment. They are used in bridge structures, dame. roofs and openings.

3) Frames:

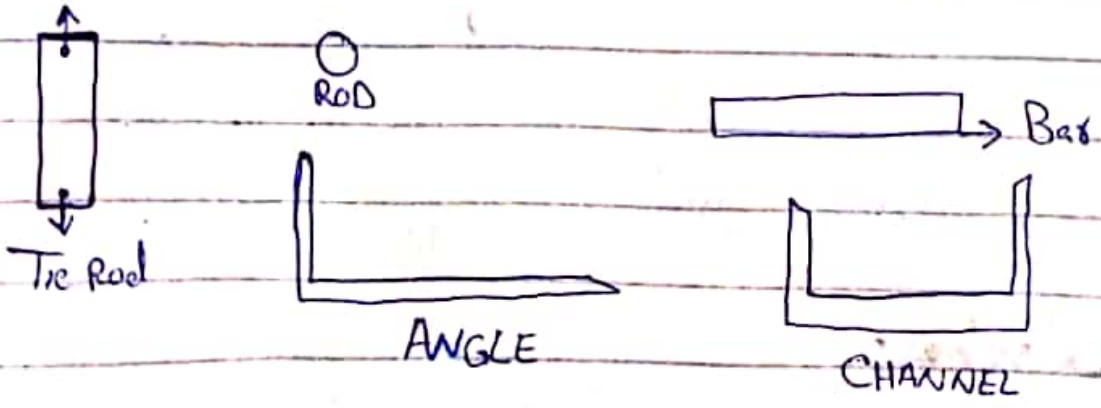
Type of structure which is used in buildings and consists of beams and Columns which are fixed or pin connected. The load on frames causes bindings of its members and has rigid point connections. This structure is indeterminater.

Structure elements:

Some of elements are:

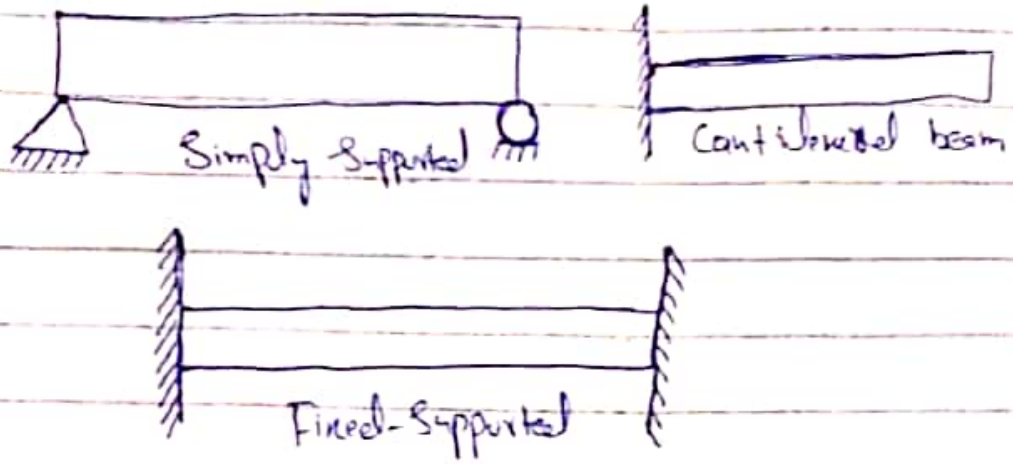
1) Tie rods:

Consists of tensile force. These members are denders bars, or rods.



2) Beams:

They are horizontal members and supports vertical loads. It resist bending moments, short carry large loads.



3) Columns:

They consist of vertical members and resist compressive loads.

Tubes and wide-flange across sections are used for metal columns. and Sequence cross sections rods are used for Concrete work.