Student ID: 13639

Program: B.Tech Civil

Subject: Theory of Structure 1

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Exam: Mid-Exam

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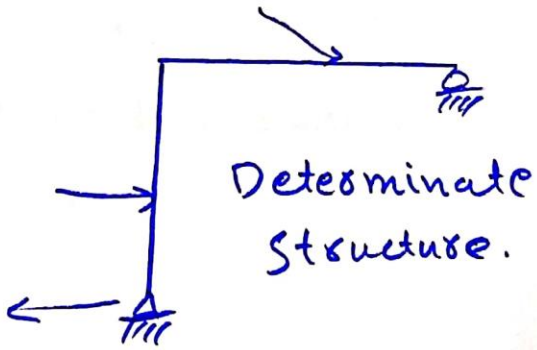
Q1

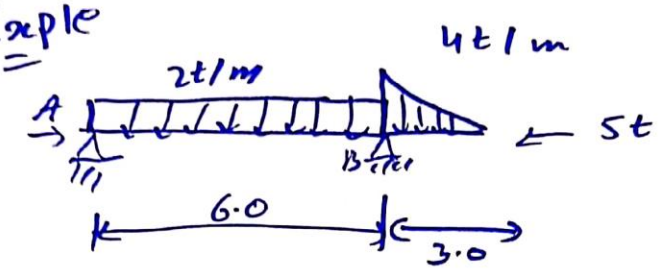
Determinacy:

=> A structure for which all the unknown reactions and forces can be determined using the the equations of equilibrium is referred to as a determinate structure.



Mathematically speaking, in a determinant structure the total number of reaction and member forces required to be calculated are equal to or less than the number of eq- of static equilibrium available.

Exple =



Sol =.

(1) $\Sigma x = 0$

$\Rightarrow$ $xA - 5 = 0$

$\Rightarrow$ $xA = 5t$

(2) $\Sigma MB = 0$

$\Rightarrow$ $YA \times 6 - 2 \times 6 \times 3 + (4 \times 3)/2 \times 1 = 0$

$\Rightarrow$ $YA = 5t$

(3) $\Sigma Y = 0$

$\Rightarrow$ $YA + YB = 2 \times 6 + (4 \times 3)/2 = 18$

$= YB \; 18 - 5$

$\Rightarrow YB = 13t$

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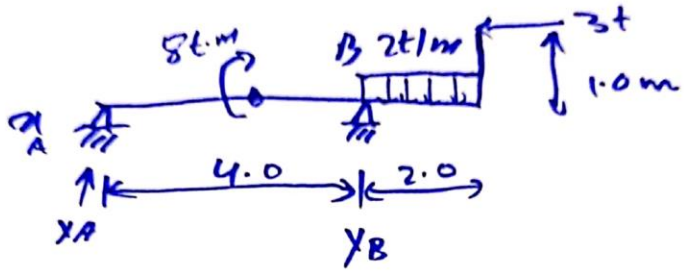
3 -

Q1

Eaple



Sol

(1) $\Sigma x = 0$

$XA = 3t$

(2) $\Sigma M_B = 0$

$Y_A \times 4 + 8 + 4 \times 1 - 3 \times 1 = 0$

$Y_A = -2.25t \uparrow$

$Y_A = 2.25t \downarrow$

(3) $\Sigma Y = 0$

$Y_A + 2 \times 2 = Y_B$

$2.25 + 4 = Y_B$, $Y_B = 6.25t \uparrow$

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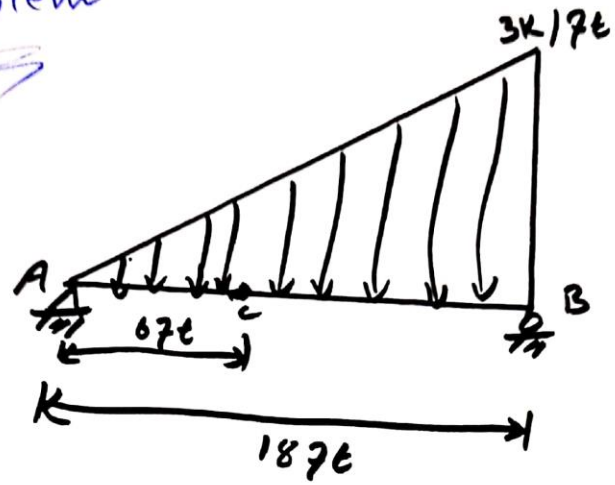
Q3

Problem



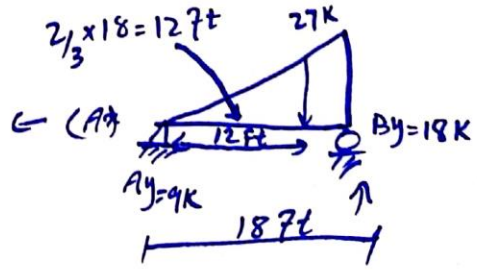
Sol

=> So we know that we will first convert the point load to the U.d.L load.

$\frac{1}{2} \times l \times h = \frac{1}{2} \times 18 \times 3 =$ **27K**

=> Know we trial the moment

$+\circlearrowleft \Sigma_i MA = 0$



Reaction

$By \times 18 = 27 \times 12$

$= By = 18K$

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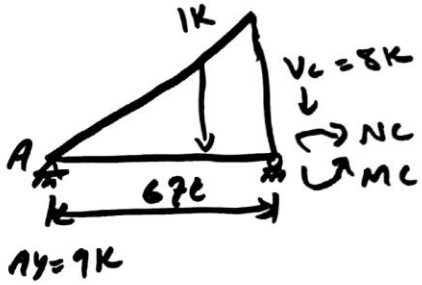
Q3

$\uparrow^{+}$ $\Sigma F_y = 0$

$A_y = -27 + 18$

$A_y = 9K$



Section A - C

⇒ Concentrated load of Δ triangle

$2/3$ from A side

$1/3$ from B side

Know we find reaction.

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

$= -V_c - 1 + 9K = 0$

$\Rightarrow V_c = 8K$

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Q3

$+\circlearrowleft \sum M_c = 0$

$M_c + 1(2) - 9(6) = 0$

$M_c = 52 \text{ K.ft}$

Ans.

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Q2
A

Advantages of Statically Indeterminate structures

=) A statically determinate system is neither better nor worse than a statically indeterminate system. It may be stronger or weaker depending on the details of the two system. Though look at the advantages it may can provide:-

=) When we provide more support and /or member to structure than required for static stability. It makes structure indeterminate. By providing this Excess member it ensures stability and also increase stiffness of the members or structure. Such as in case of truss we provide additional diagonal members

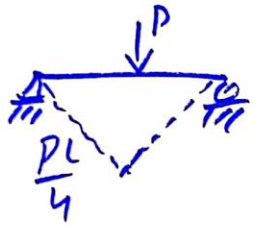
In structure ① 13639

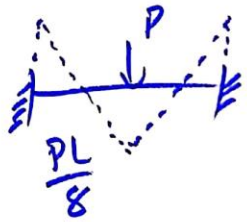
Q2

A ⇒ to ensure stability.

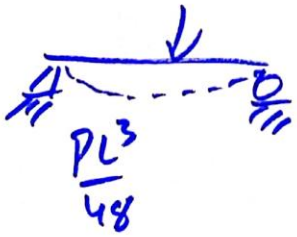
So the Advantages Indeterminate Structure over determinate:

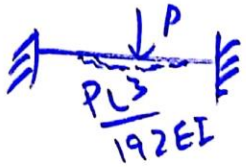
① Stresses in Indeterminate are generally lower than determinate Structure.





② Deflection in case of Indeterminate Structure is less than those compared to determinate due to greater stiffness





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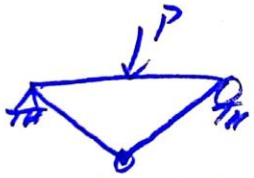
Q2A

(3) statically indeterminate structure have capacity to redistribute the loads. If a part (or member or support) of such a structure fails, the entire structure will not necessarily collapse and the loads will be redistributed to the adjacent portions of the structure.



Plastic Hinge

plastic hinges.

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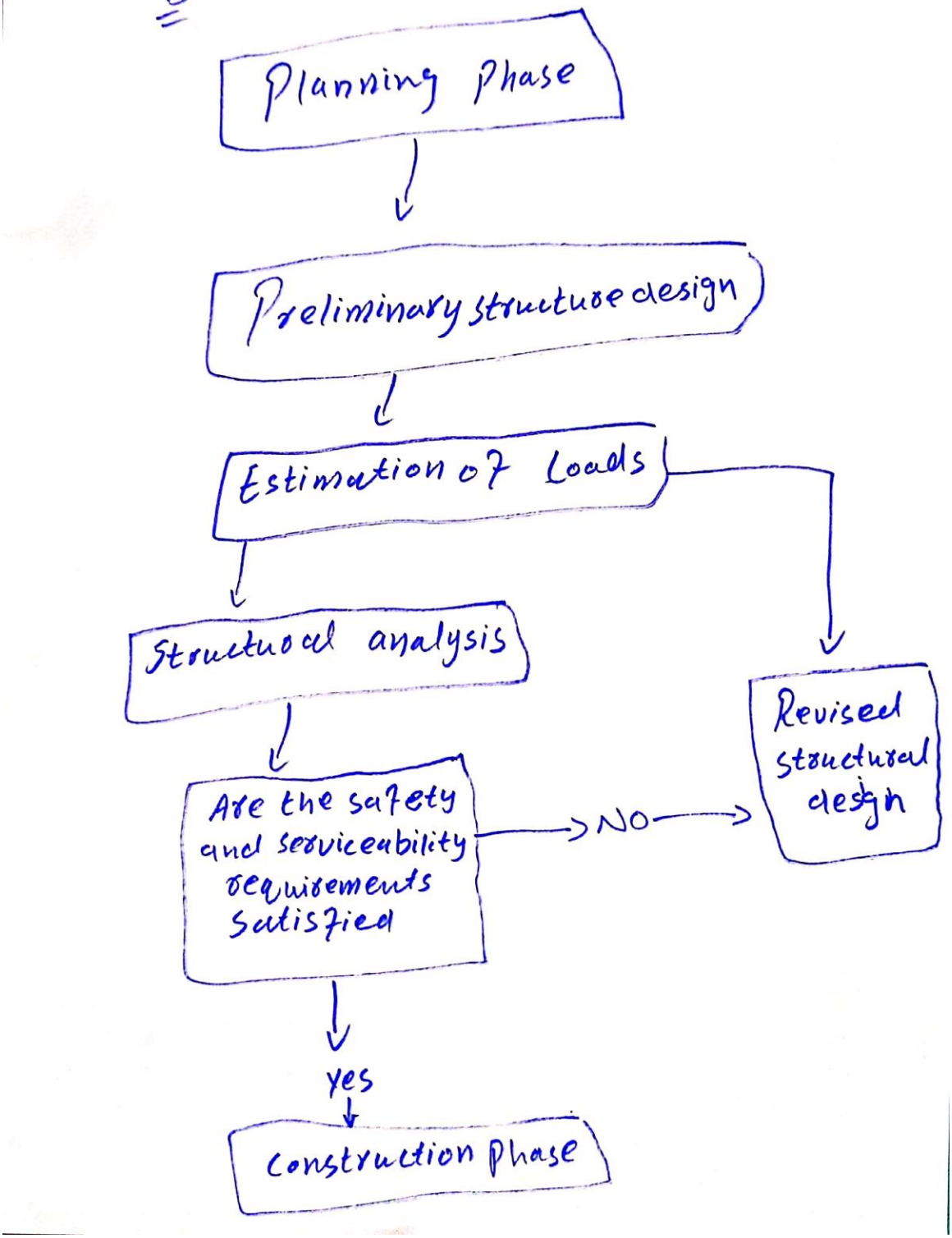
= Q2

B

Role of structural analysis in structural Engineering Projects.

=> Structural engineering is the science and art of Planning, designing and constructing safe and ~~en~~ economical structures that will serve their intended Purposes. Structural analysis in an integral Part of any structural engineering Project, its function being the prediction of the performance of the proposed structure. A flowchart showing the varionse phases of a typical structural engineering Project is presented in Figure.

= Q2
B


Planning Phase
Preliminary structure design
Estimation of Loads
Structural analysis
Are the safety and serviceability requirements satisfied
NO
Revised structural design
yes
Construction Phase