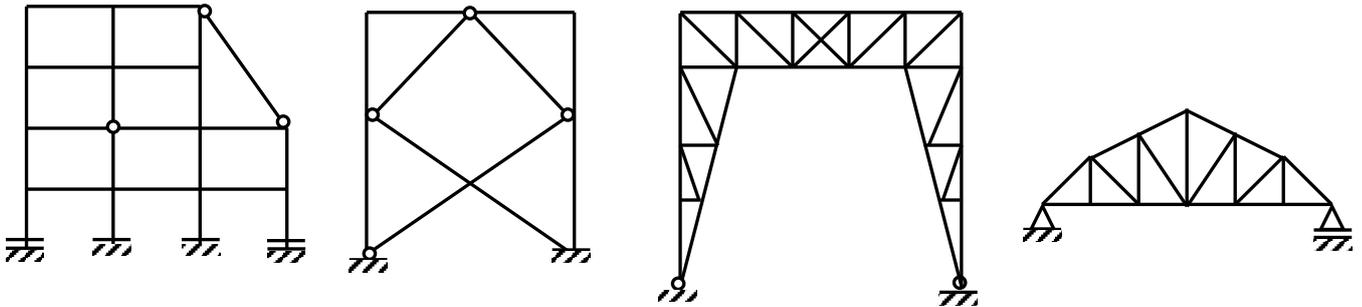


Yıldız Technical University-Faculty of Civil Engineering 2023-2024 Academic
Year Spring Semester Structural Analysis I Worksheet

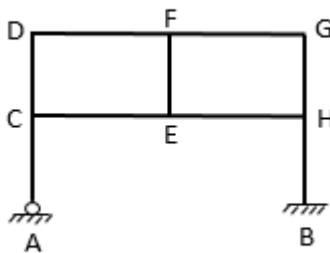
NOTE:

- This worksheet is prepared with the purpose of improving your comprehension of the course materials considering that problem solving sessions might not be sufficient. It is suggested to solve related problems after a topic is covered in lecture. It is obvious that you will be more successful if you consider this suggestion seriously.
- The force unit is **kN**, and the length unit is **m**, unless it is mentioned.

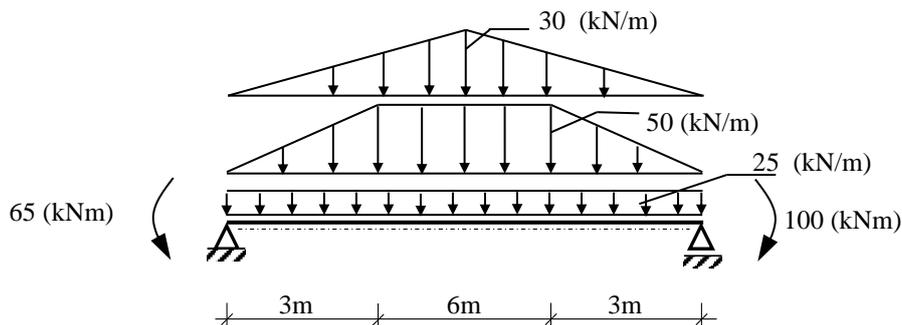
Question 1: Determine the **degree of indeterminacy** of the systems shown in the following figures.



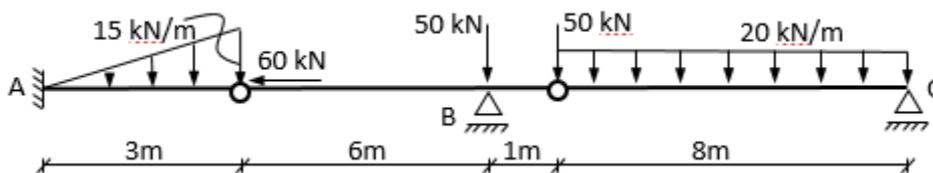
Question 2: Separate the system shown in the figure into two systems properly in such a way that the degree of indeterminacy is 4.



Question 3: Determine the **maximum moment and its location** in the simply supported beam shown in the figure, which is subjected to the loads shown in the figure.

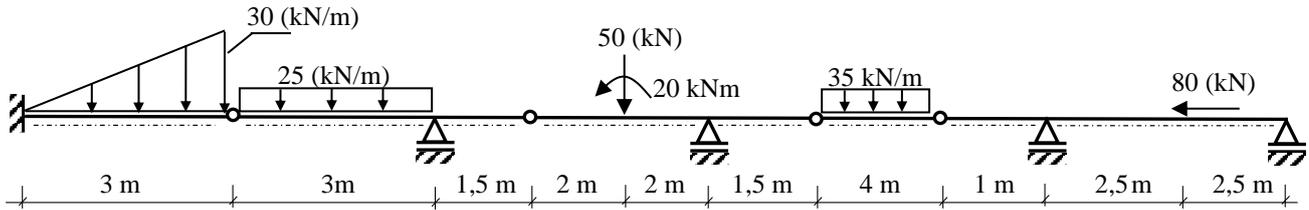


Question 4: Draw **M, N, V** diagrams of the system given below.

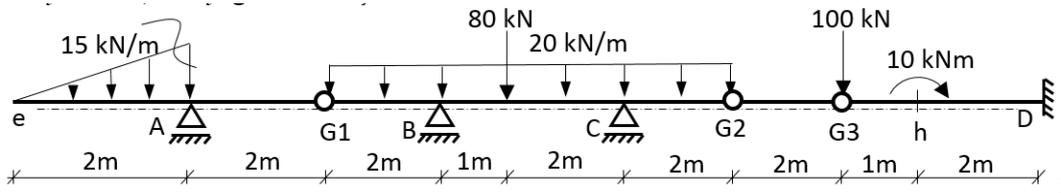


Yıldız Technical University-Faculty of Civil Engineering 2023-2024 Academic
Year Spring Semester Structural Analysis I Worksheet

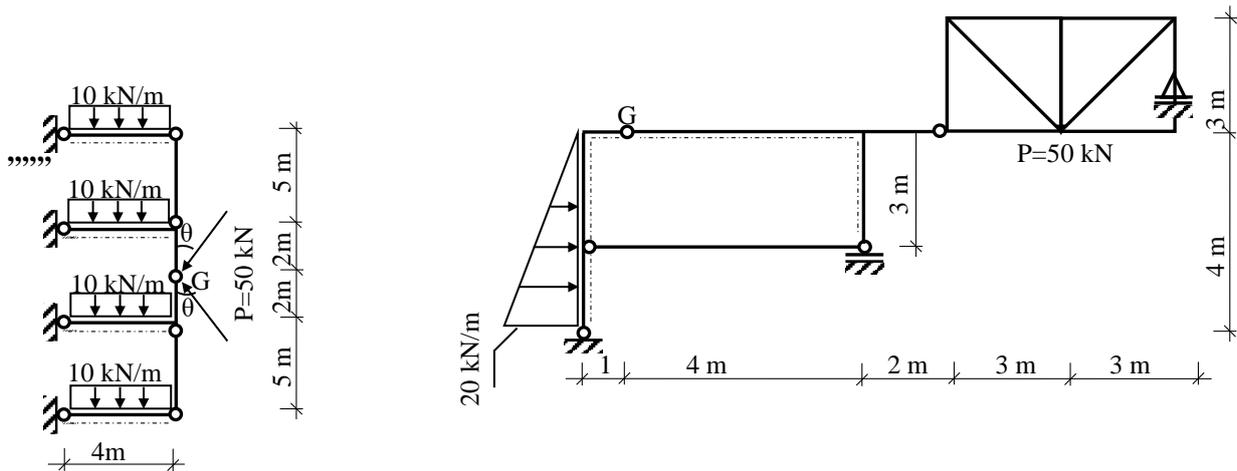
Question 5: Draw **M, N and V** diagrams of the system given below.



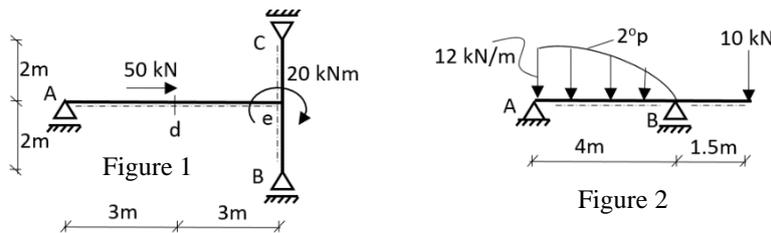
Question 6: Draw **M, N and V** diagrams of the system given below.



Question 7: Draw the **internal force diagrams** of the structural systems shown in the figure. ($\theta = 45^\circ$)

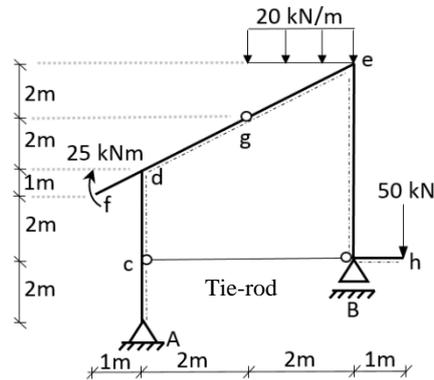


Question 8: Calculate the **support reactions** of the structures given in Figure 1 and Figure 2.

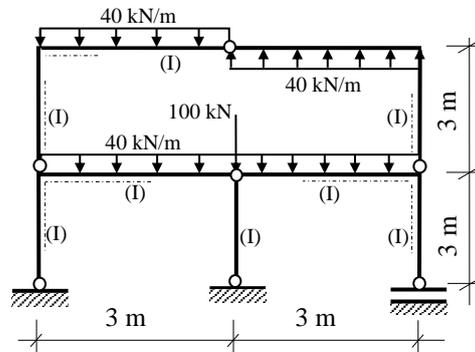


Question 9: Calculate the internal forces at **characteristic points** of the system given in the following figure and draw **M, N, V** diagrams.

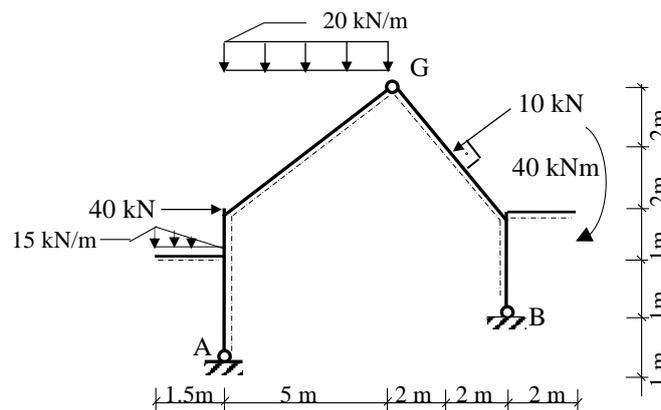
Yıldız Technical University-Faculty of Civil Engineering 2023-2024 Academic
Year Spring Semester Structural Analysis I Worksheet



Question 10: Draw only **M** and **V** diagrams of the structural system shown in the figure.

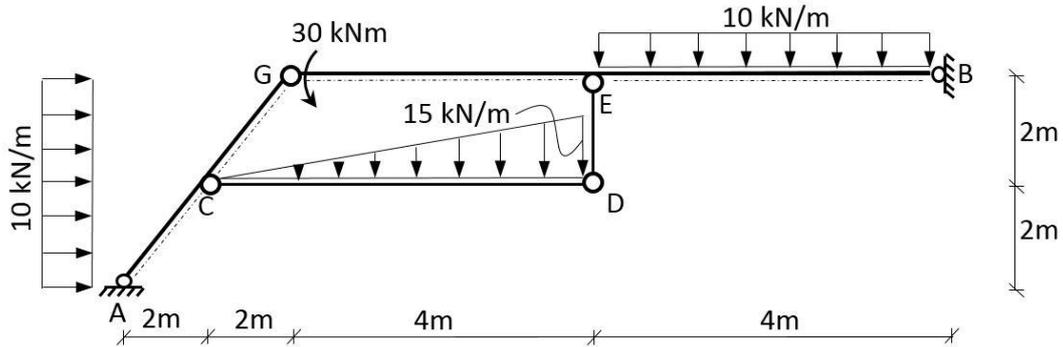


Question 11: Draw **M**, **N**, **V** diagrams of the structural system shown in the figure, by calculating the internal forces at the critical points.



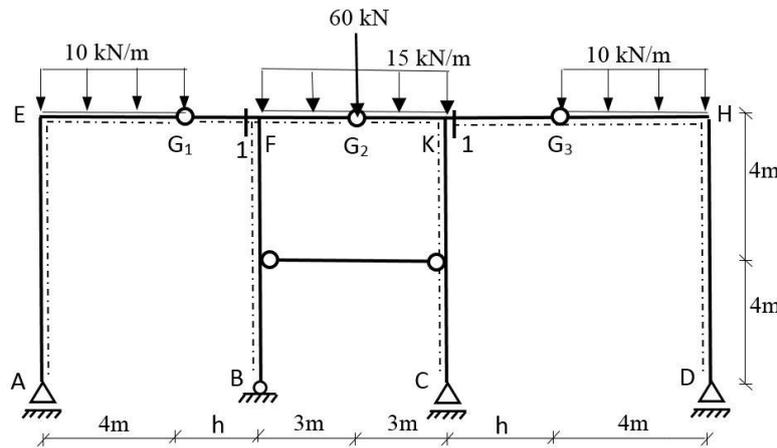
Yıldız Technical University-Faculty of Civil Engineering 2023-2024 Academic
Year Spring Semester Structural Analysis I Worksheet

Question 12: Determine the **support reactions** of structural system shown in the figure

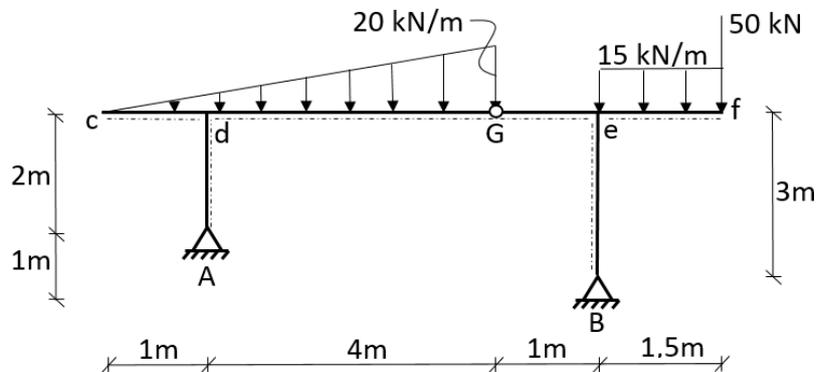


Question 13: In the frame;

- Estimate the distance **h** of the system given below to satisfy the bending moment at **section-1** to be **60 kNm**?
- Draw **M, V** diagrams of the system



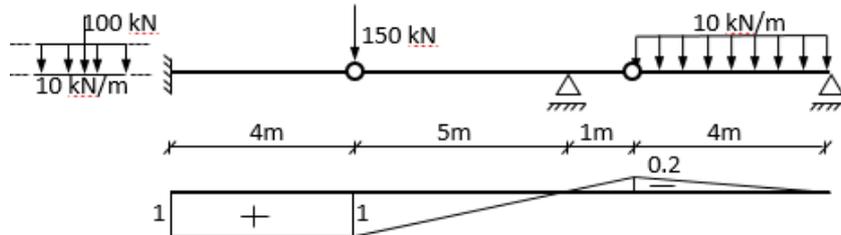
Question 14: Draw **M, N, V** diagrams of the system given in the following figure by calculating the internal forces of **characteristic points**.



Yıldız Technical University-Faculty of Civil Engineering 2023-2024 Academic
Year Spring Semester Structural Analysis I Worksheet

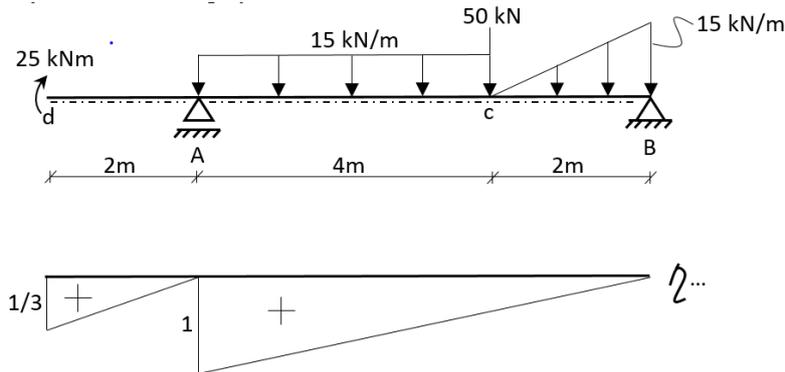
Question 15:

- Indicate that the given influence line belongs to which internal force?
- Calculate the maximum and minimum values of the **internal force indicated in (a)** under dead load and moving load by using the influence line.

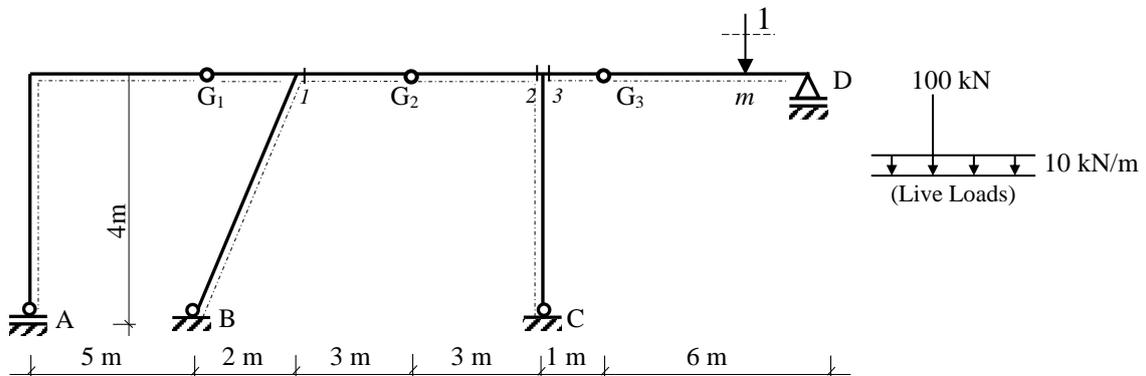


Question 16: For the beam system given in figure below,

- Indicate that the given influence line belongs to which internal force?
- Draw the influence lines of V_c , M_c , V_{Ad} and M_A for a unit vertical load.
- Calculate the shear force at “C” for the given loads by using influence lines.



Question 17:



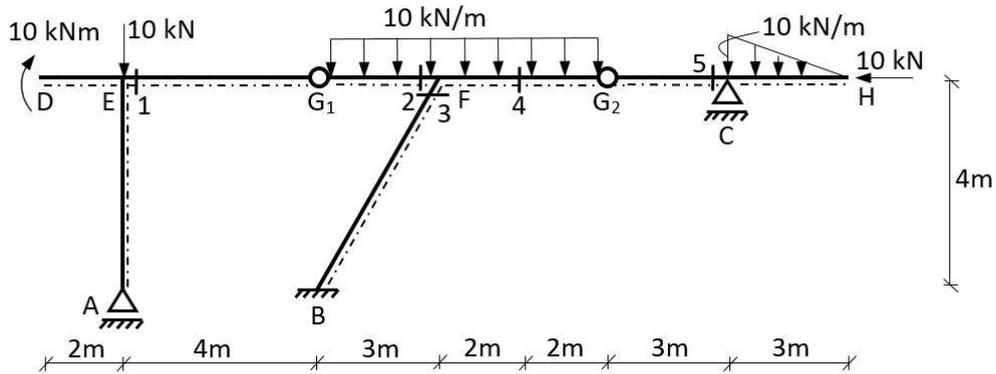
- Draw the influence lines of ηR_{Ay} , ηR_{Cy} , ηV_1 , ηM_1 , ηV_2 , ηV_3 , ηM_3 , ηG_{3y} , ηN_c .

Yıldız Technical University-Faculty of Civil Engineering 2023-2024 Academic
Year Spring Semester Structural Analysis I Worksheet

- b) Determine the maximum bending moment (M_1) at section "1" by using the influence line drawn in (a) due to a series of loads shown in the figure above.

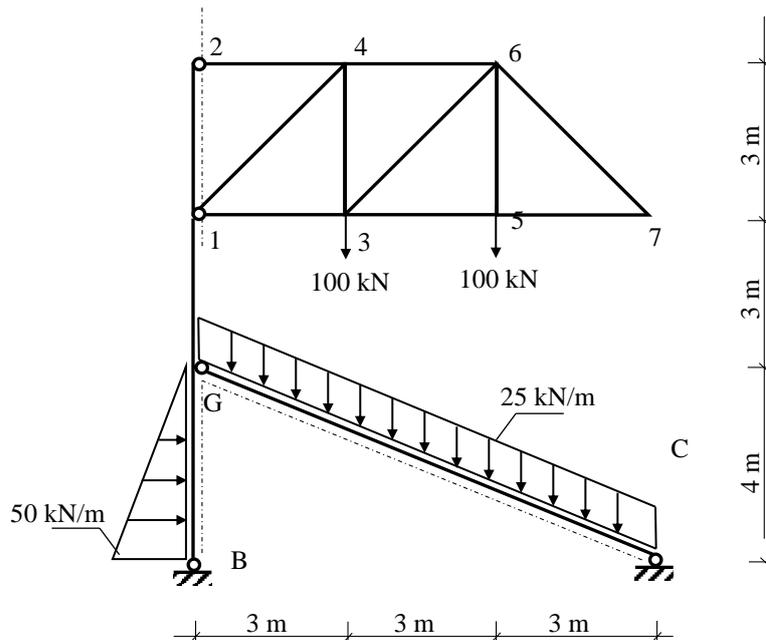
Question 18: The geometrical properties of a combined frame system are shown in figure below.

- a) Draw M, N, V diagrams of the system due to the dead loads given in the figure.
b) Draw influence lines of ηM_B , ηV_1 , ηM_2 , ηN_3 , ηM_4 ve ηV_5 for the unit vertical load moving from point D to point H.



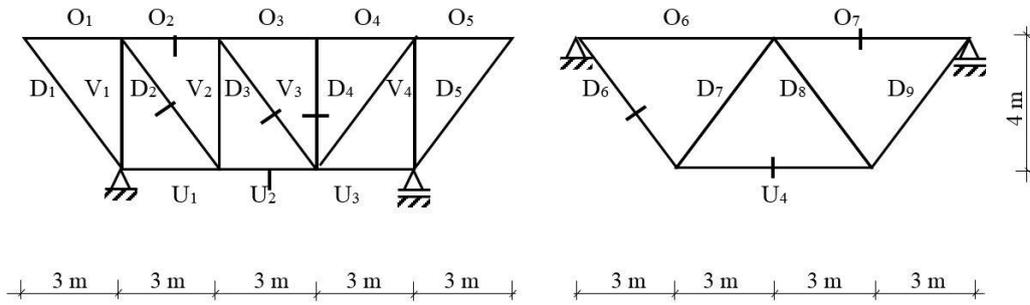
Question 19: For the system shown in the figure;

- a) Draw **internal forces diagrams** of the system shown in the figure.
b) Draw influence lines for the truss elements N_{3-5} , N_{3-6} , N_{3-4} , in case that the unit force act at the bottom chord of the truss system. Under the dead loads shown in the following figure, determine the forces in the truss elements by using the influence lines.



Yıldız Technical University-Faculty of Civil Engineering 2023-2024 Academic
Year Spring Semester Structural Analysis I Worksheet

Question 20: Draw the influence lines of the marked truss elements indicated in the figure in case that the unit force act at upper chord of the systems.



Good Luck...

Prof. Dr. Bilge DORAN
Prof. Dr. Barış SEVİM
Asst. Prof. Dr. Cem YENİDOĞAN
Res. Asst. Dr. Alkız MERMER
Res. Asst. Birkan DAĞ
Res. Asst. Ahmet YILDIRIM