

# MOS PROJECT

DEFLECTIONS IN BEAMS

# Objective

The objective of our project is to create a **user-interactive** and **dynamic** tool to help us easily determine and visualise the **shear force diagrams**, **bending moment diagrams**, **slope**, and **deflection of a beam** when subjected to various types of loads.



# Method

- Took input of all the relevant information needed - types of forces and their locations.
- Defined a function for drawing the beam with the supports and the loads.
- Defined a function for integration - the trapezoidal rule is used in numerical integration.
- Calculated the shear force and bending moment - defined arrays for both which store the values of the respective function for each point of the beam.
- Calculated the constants  $c_1$  and  $c_2$  by using the condition of deflection at the supports and using these constants to calculate the the slope and deflection of each point of the curve and storing them in arrays.
- Plotted these quantities and created an online app using Streamlit to integrate all the aspects of the project (from taking the input to displaying the state of the beam from displaying the output) in one place



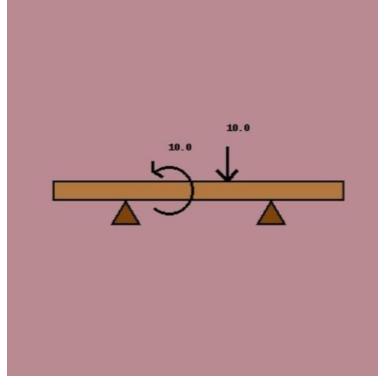
# INPUT

Young's Modulus 'E' (Pa):  
100000.00

Second Moment of Area 'I' (m<sup>4</sup>):  
1.00

Enter Beam Length (m):  
0 100  
Beam Length: 100 m

Enter Support Locations (m):  
0 100  
Support Locations: 25 m and 75 m



Select load type:  
☐ Point Moment  
☒ Point Force  
☐ Constant Force Profile  
☐ Triangular Force Profile

Enter Point Force Magnitude (N):  
-10.00

Enter Point Force Location (m):  
0 100  
60

Add load

Select load type:  
☒ Point Moment  
☐ Point Force  
☐ Constant Force Profile  
☐ Triangular Force Profile

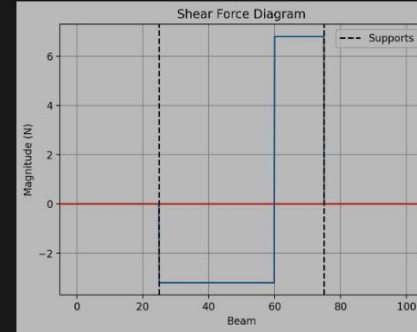
Enter Point Moment Magnitude (N-m):  
10.00

Enter Point Moment Location (m):  
0 100  
40

Add load

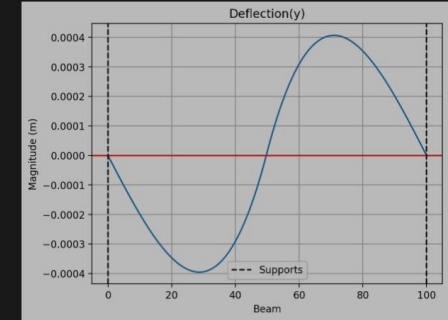
# OUTPUT

Shear Force Diagram



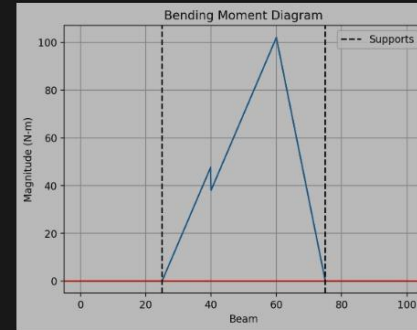
Maximum Shear Force Value: 10.0 N

Deflection of Beam



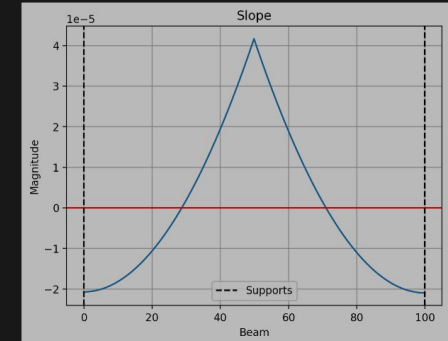
Maximum Deflection: 0.0004066385894499789 m

Bending Moment Diagram



Maximum Bending Moment Value: 101.99999999999925 N-m

Slope of beam



Maximum Slope: 4.166788049999969e-05