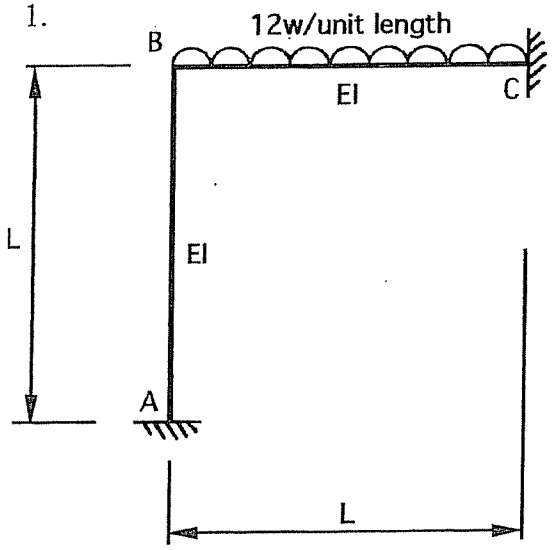
University of Surrey
Faculty of Engineering and Physical Sciences
MEng and BEng programmes in Civil Engineering

Structural Mechanics and Analysis – ENG2103

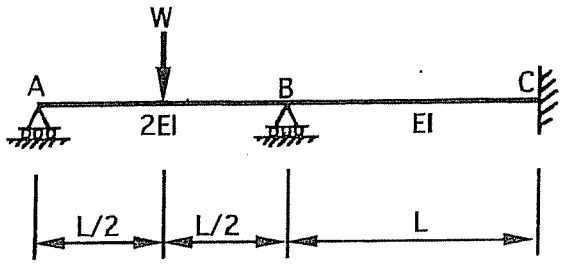
Tutorial: Displacement Method – Applied to the solution of Statically Indeterminate Beams and Unbraced Frames (without sway)

For each of the rigidly-jointed plane frame and beam structures shown, determine the joint rotations, solve for the element-end moments, sketch the complete BMD, solve for the support reaction forces and sketch the complete SFD.

1.

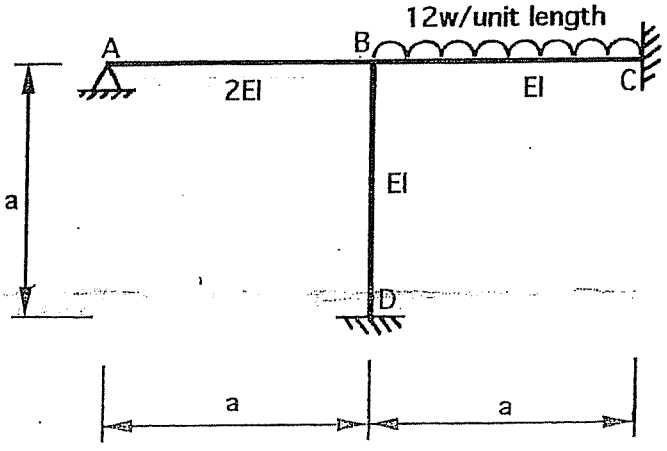


2.



Ans: $\theta_A = WL^2/40EI$; $\theta_B = -3WL^2/160EI$

3.



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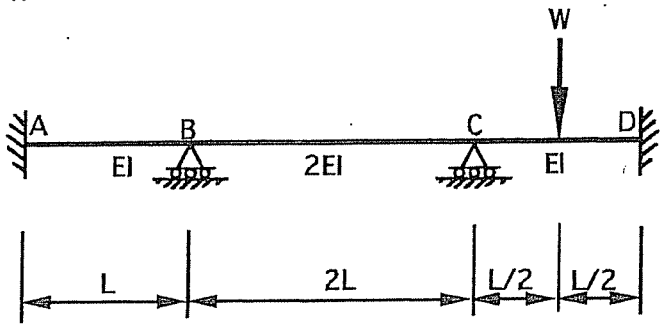
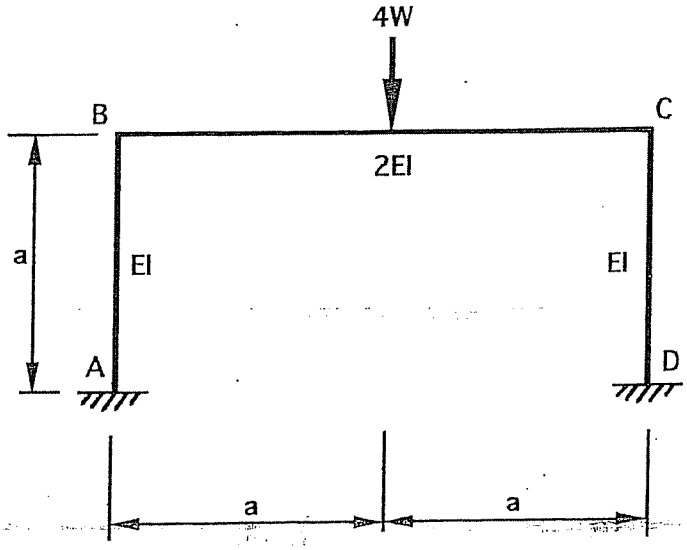


Ans: $\theta_B = -WL^2/240EI$

$\theta_C = WL^2/60EI$

5.



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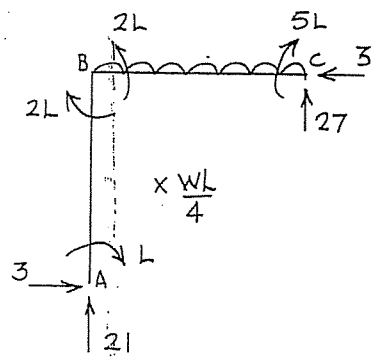
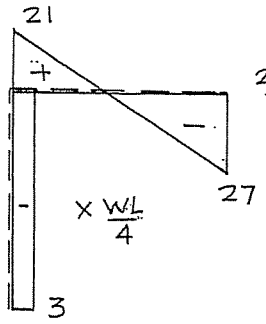
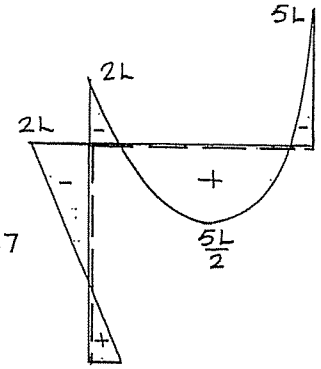
$\theta_B = \frac{WL^3}{8EI}$



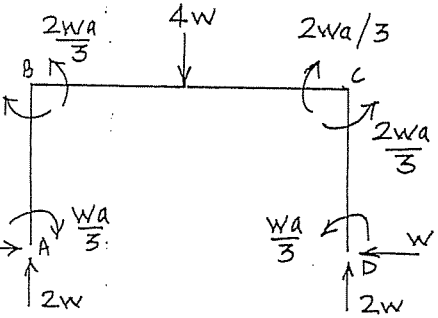
Forces



SFD

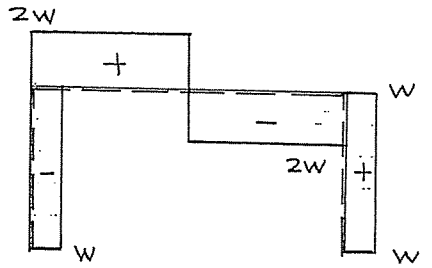


BMD

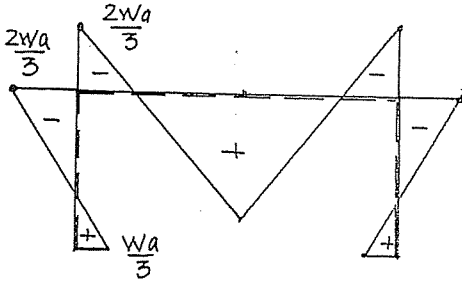


Forces

$\theta_B = -\theta_C = \frac{wa^2}{6EI}$



SFD



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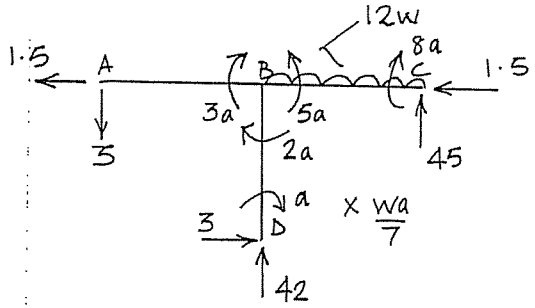
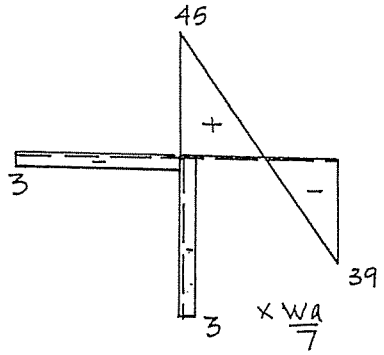


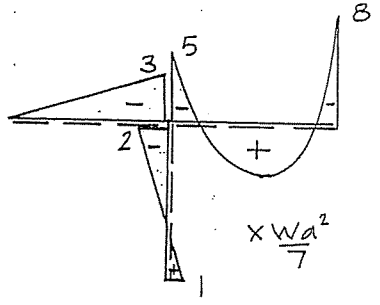
Forces

$\theta_A = -\frac{wa^3}{28EI}$

$\theta_B = \frac{wa^3}{14EI}$



SFD



BMD