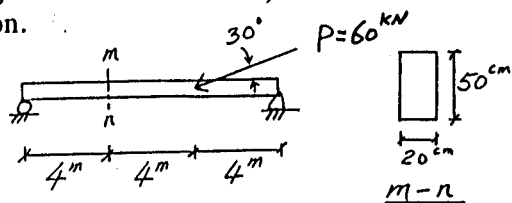
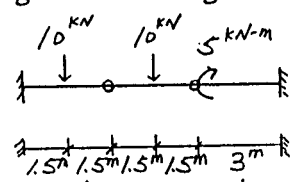


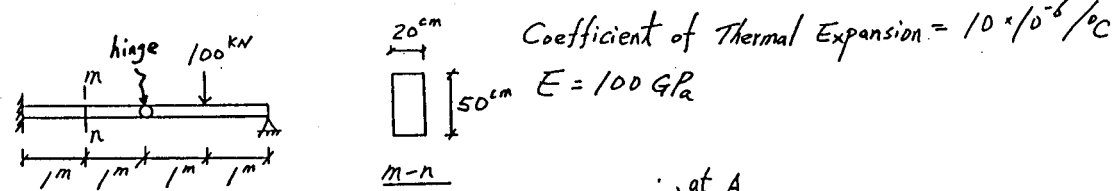
- 1) (20%) Assume a force of 60 kilo-Newton is applied at the centroid of the cross section as shown in the figure below. Calculate the stress state (magnitude and direction) at the bottom of the beam of the m-n section.



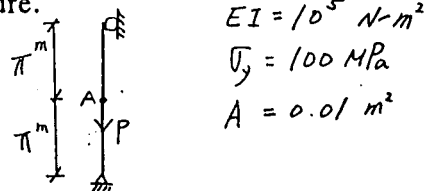
- 2) (20%) There are two hinges in the beam as shown below. Calculate shear and bending moment diagrams of the beam.



- 3) (25%) A beam experiences an increase of temperature 20 degree °C and loading of 100 kN as shown below. Calculate the maximum (principal) shear and normal stresses on the surface of the beam at m-n section 10 centimeter below the top fiber.



- 4) (15%) Predict damaged mode of the column if loading P is increased from zero to failure.



- 5) (20%) Find the particular and homogeneous solutions of the following equation.

$$y'' + 5y' + 6y = 3e^{-2x} + e^{3x}$$