Problem 1
For the frame shown below, determine the relative displacement of point A to point B using the unit-load method.

Problem 2
For the frame shown below, calculate the following parameters by unit-load method and Castigliano method. $I = 7.81 \times 10^8 \text{ mm}^4$, $E = 200 \text{ GPa}$, $EI = \text{cte}$ (for all frame elements)

$\Delta_B = ?$, $\Delta_C = ?$, $\Delta_D = ?$, $\theta_B = ?$
Problem 3
In the truss shown below, the temperature of members KH, HE and EB has increased 20 °C, and the temperature of members LI, IF and FC has decreased the same amount. The members KL, HI, EF and BC have been shortened 1.5 cm with respect to their actual length. Determine the following parameters.
   a) Displacement of point D
   b) Angle between member EF and horizontal line.
The angle between members are either 45° or 90°. All spans are 3 m. EA is constant for all members, and you should express your answers in terms of EA.

Problem 4
With the use of Castigliano method and considering axial and bending deformations, determine the vertical displacement of node B and displacement of roller C.
EA and EI are constant. (Your answers should be expressed in terms of EA and EI.)
Problem 5

In the frame shown below, the support A has settled 0.1 cm in vertical direction. While analyzing the whole frame, determine the displacement of point C.

EA and EI are constant. (Your answers should be expressed in terms of EA and EI.)

Problem 6

Determine the vertical displacement of point C and the horizontal displacement of point D using both unit-load and Castigliano method. EI = 10^6 ton.m^2