ME 260: Structural Optimization: Size, Shape, and Topology Assigned: Sep. 12, 2023 Homework 2 Due: Sep. 21, 2023

Problem 1 (10 points)

For the truss shown on the right side, give the contribution of each truss member to the displacement in the desired direction at the point indicated. Push the areas of cross-section



of two or more elements to nearly zero to amplify the displacement for the same applied force by keeping the volume of material of the truss the same. You can iterate manually or use optimization to do the task. Show your steps clearly and include all relevant figures and Matlab code you may use or write.

Data: Young's modulus: 2 GPa; applied force = 10 N; coordinates are in mm; all areas of cross-section 5 mm².

Problem 2 (20 points)



<u>Data</u>

Initial guess for the areas of cross-section for all truss members: cm²; Upper bound: 1 cm²; Lower bound: 0 cm²

Young's modulus: 210 GPa

Mass density: 7800 kg/m³

Upper bound on the truss weight: 1.8638 kg

For the truss shown here, please run the optimality criteria method manually, to minimize the mean compliance for given weight of the truss. Show outer loop and inner loop steps clearly. You may use the Matlab code provided for truss analysis to compute mean compliance and weight. Your final answers should include optimized areas of cross-section for all seven members, mean compliance, and the Lagrange multiplier.