1. (15 points) Knowing that for the extruded beam shown the allowable stress is 120 MPa in tension and 150 MPa in compression, determine the largest couple M which may be applied.

2. (15 points) The 150 × 300 mm timber beam has been strengthened by bolting to it the steel reinforcement shown. The modulus of elasticity for wood is 12 GPa and for steel is 200 GPa. Knowing that the beam is bent about a horizontal axis by a couple of moment M = 50 kN·m, determine the maximum stress in (a) the wood, (b) the steel.

3. (25 points) Determine the plastic moment M_p of a steel beam of the cross section shown when the beam is bent about a horizontal axis. Assume the steel to be elastoplastic with a yield strength of 200 MPa.

4. (20 points) A short 120 × 180-mm column supports the three axial loads shown. Knowing that section ABD is sufficiently far from the loads to remain plane, determine the stress at (a) corner A, (b) corner B.

5. (25 points) The couple M acts in a vertical plane and is applied to a beam oriented as shown. Determine (a) the angle that the neutral axis forms with the horizontal plane, (b) the maximum tensile stress in the beam.

6. (25 points) The couple M acts in a vertical plane and is applied to a beam of the cross section shown. Determine the stress at point A.

Prof. Dr. M. Kemal Apalak