1. (20 points) Two vertical forces are applied to a beam of the cross section shown. Determine the maximum tensile and compressive stresses in portion BC of the beam.

2. (20 points) Five metal strips, each 40 mm wide, are bonded together to form the composite beam shown. The modulus of elasticity is 210 GPa for the steel, 105 GPa for the brass, and 70 GPa for the aluminum. Knowing that the beam is bent about a horizontal axis by couples of moment $M = 1800$ N·m, determine the maximum stress (a) in the steel, (b) in the brass, (c) in the aluminum. (d) Also, determine the radius of curvature of the beam.

3. (30 points) (a) Determine the plastic moment $M_p$ of a steel beam of the cross section shown, assuming the steel to be elastoplastic with a yield strength of 250 MPa. (b) If the plastic moment is applied and removed, determine the residual stress at $y = 30$ mm. Draw the stress distributions.

4. (20 points) Knowing that the allowable stress in section ABD is 70 MPa, determine the largest force $P$ which may be applied to the bracket shown.

5. (20 points) The couple $M$ is applied to a beam of the cross section shown in a plane forming an angle $\beta$ with the vertical. Determine (a) the stress at point A, (b) the stress at point B, (c) the angle that the neutral axis forms with the horizontal plane.

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