1. (25 points) Two bars strips are securely bonded to an aluminum extrusion as shown. Using the data given below, determine the largest permissible bending moment when the composite member is bent about a horizontal axis. $E = 70$ GPa, $\sigma_{al} = 100$ MPa for aluminum, $E = 105$ GPa, $\sigma_{al} = 160$ MPa for brass.

2. (30 points) A beam of the cross section shown is made of a steel which is assumed to be elastoplastic with $E = 200$ GPa and $\sigma_y = 290$ MPa. For bending about the $z$-axis, determine the bending moment and the radius of curvature at which (a) yield first occurs, (b) the plastic zones at the top and bottom of the beam are 25 mm thick, and after this moment has been removed, determine (c) the residual stress at $y = 50$ mm, (d) the points where the residual stress is zero, (e) the radius of curvature corresponding to the permanent deformation of the beam.

3. (30 points) A vertical rod is attached at point A to the cast iron hanger shown. Knowing that the allowable stresses in the hanger are $\sigma_{all} = 35$ MPa and $\sigma_{all} = -85$ MPa, determine the largest downward force and the largest upward force, which may be exerted by the rod.

4. (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. $I_{yy} = 7.24 \times 10^6$ mm$^4$, $I_{zz} = 2.61 \times 10^6$ mm$^4$, $I_{yz} = -2.54 \times 10^6$ mm$^4$.

5. (25 points) An extruded beam has the cross section shown and is subjected to a vertical shear of 50 kN. For $t = 6$ mm, determine the shearing stress at (a) point $a$, (b) point $b$, and (c) the shearing stress distribution.

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