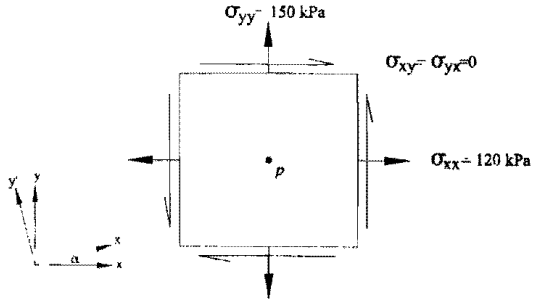
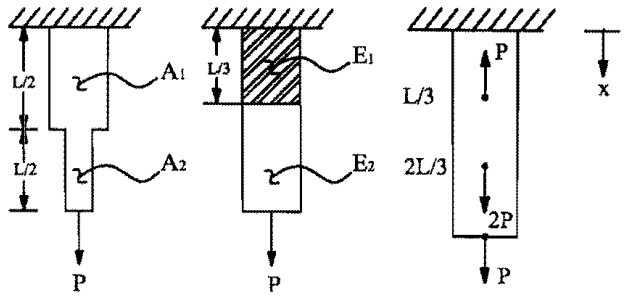
※ 考生請注意：本試題 ☑可 □不可 使用計算機

1. Consider the 2-D state of stress shown to the right.

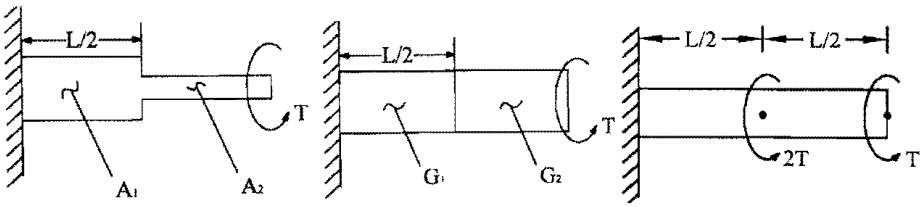
   Find (a) the values of stress α'_{xx}, α'_{yy}, α'_{xy} for $\alpha = 45^{\circ}$ (10%), and (b) the principal stresses and the maximum shearing stress (10%).



2. Consider members under axial loading as shown below. Find the end displacement δ in each of the members (20%).



3. Consider members subjected to the torques(s) as shown below. Find the angle of twist at the end of the cylinder for each case (20%).



4. Modeling a saccular aneurysm (囊狀動脈瘤) as a thin-walled sphere, assume that it has an inner radius of 2.5 mm and a thickness of 15 μm at a mean blood pressure of 120 mmHg. Calculate the stress $\sigma_{\theta\theta}$ or $\sigma_{\phi\phi}$ (15%), and determine if rupture is likely if the critical stress is on the order of 5 MPa (5%).

5. The rigid bar DEF is welded at point D to the steel beam AB. For the loading shown, determine (a) the equation defining the shear and bending moment at any point of the beam (15%), (b) the location and magnitude of the largest bending moment (5%).