

國立臺灣科技大學

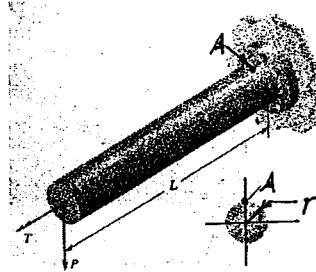
九十三年年度碩士班考試試題

系所組別：機械工程系甲組、機械工程系乙組

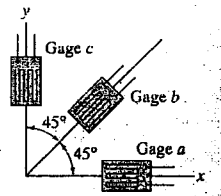
科 目：材料力學

總分 100 分，每題 25 分。

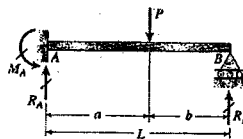
1. A circular shaft, with radius r and length L , is built into a wall and loaded with a torque T and a load P , as shown below. Determine the maximum shear stress and principal stresses at point A on the shaft. Take $r = 30\text{mm}$, $L = 1\text{m}$, $P = 5\text{kN}$ and $T = 7000\text{N}\cdot\text{m}$.



2. At a point on an aluminum alloy plate subjected to a plane stress loading in the x - y plane, the 45° rectangular rosette shown below measured the following strains: $\varepsilon_a = 200\mu$; $\varepsilon_b = 100\mu$; $\varepsilon_c = -80\mu$. Determine the stress components σ_x , σ_y , and τ_{xy} . The material has a Young's modulus of 70GPa and a Poisson's ratio of 0.33.



3. A propped cantilever beam AB of length L carries a concentrated load P acting at the position shown below. Determine the reactions R_A , R_B , and M_A for this beam.



4. A thin-walled cylindrical vessel has an outside diameter of 2m and a wall thickness of 10mm . The vessel is made of the same material as in Problem 2. During proof testing of the vessel, an axial strain of 300μ is recorded. Determine
- internal pressure applied to the vessel,
 - the axial and hoop stresses in the vessel,
 - the maximum shear stress in the vessel,
 - the hoop strain present when the axial strain was measured.

