

國立中山大學 107 學年度碩士暨碩士專班招生考試試題

科目名稱：材料力學【機電系碩士班乙組】

題號：438006

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）（問答申論題） 共 1 頁第 1 頁

Prob. #1 (40%)

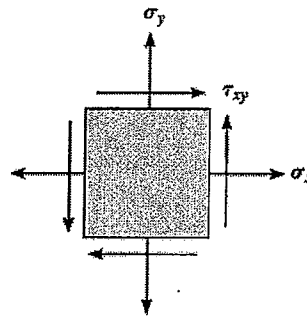
- (1) Plot the engineering and true stress-strain diagrams for a ductile material. (10%, 不必依照比例，並請標出圖上各個區域的名稱以及相對應的應力名稱，錯一個扣一分，扣至 10 分為止)
- (2) 以中文解釋（或回答）下列名詞（或問題）(30%)
 - (a) Homogeneous and isotropic material (2%)
 - (b) The gauge-length (1%) (可圖示)
 - (c) Statically indeterminate problem (2%)
 - (d) Offset method (2%) (可圖示)
 - (e) Modulus of resilience (2%) (解釋加圖示)
 - (f) Modulus of toughness (2%) (解釋加圖示)
 - (g) The conventional and true stress and strain (2%) (可直接用公式回答)
 - (h) Saint-Venant's Principle (2%)
 - (i) Hooke's law (2%) (解釋加公式)
 - (j) Factor of safety (2%) (必須顯示所有公式)
 - (k) Poisson's ratio (2%) (公式及其範圍)
 - (l) General state of stress (9%, 請畫出來並標示之，錯一個扣一分，扣至 9 分為止)

Prob. #2 (30%)

Draw the Mohr's circle according to the given stress state and prove that:

$$\tan 2\theta_p = \frac{\tau_{xy}}{(\sigma_x - \sigma_y)/2}$$

$$\sigma_{1,2} = \frac{\sigma_x + \sigma_y}{2} \pm \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + (\tau_{xy})^2}$$



Where θ_p is the plane of maximum normal stress and $\sigma_{1,2}$ are the principal stresses.

Prob. #3 (30%)

The Am1004-T61 magnesium tube is bonded to the A-36 steel rod. If a torque of $T = 5 \text{ kN}\cdot\text{m}$ is applied to end A, determine the maximum shear stress in each material. Sketch the shear stress distribution. $G_{st} = 75 \text{ GPa}$ and $G_{mg} = 18 \text{ GPa}$.

