1. 若材料產生塑性變形時，其應力與應變關係爲 $\sigma = k \cdot \varepsilon^n$ (k：強度係數；n：硬度硬化指數)，試證明 necking 產生時，$n = \varepsilon_t$ (ε_t：真應變)。(10%)

2. 請說明析出強化的三步驟及其強化理論。(15%)

3. 材料爲消除因冷加工所造成之硬化而做退火處理，試說明三階段之組織變化，並比較三階段之晶粒大小、抗拉強度與伸長率。(15%)

4. 比較熱作加工與冷作加工之區別，又如 Fe、Pb 的常溫加工是屬於冷作還是熱作。(10%)

5. 金屬材料、陶瓷材料、聚合物材料之特性各有何不同之處 (10%)

6. 試請繪出 AISI 1045 中碳鋼退火後之拉伸試驗曲線，並標出各特徵點。又如何由曲線中求取或定義降服強度？又對鑄鐵材料或調質鉻鉬鋼(SCM439)材料如何求取或定義降服強度？(20%)

7. 閱讀下列三段小文章，用中文精確寫出意思，劃底線字請解釋

   ✧ The decreasing geometries and increasing die sizes of today's VLSI circuits are demanding ever more stringent controls over particle contamination on semiconductor **wafers** during their processing. Consequently, there is a need for objective inspection techniques to monitor defects and contaminants on the surface of semiconductor devices. (7%)

   ✧ It is found that during the deformation process, while the **dislocation** density increases monotonically, the average fluctuation exhibits a maximum corresponding to work hardening(7%)

   ✧ Analysis of the stress-strain characteristics and X-Ray diffraction results reveal that the **fracture toughness** of the specimens can not be simply attributed to the phase transformation (6%)