

國立中央大學103學年度碩士班考試入學試題卷

所別：機械工程學系碩士班 乙組(製造與材料)(一般生) 科目：材料導論與機械製造 共 1 頁 第 1 頁  
本科考試可使用計算器，廠牌、功能不拘 \*請在試卷答案卷(卡)內作答

1. 某平面與單位晶胞的  $a$ 、 $b$ 、 $c$  三個軸分別相交於  $1a$ 、 $2b$ 、 $3c$  上，試求其平面指標(即米勒指標-Miller Index)。 (3%)
2. 計算下列理想晶體(即硬球模型)之堆積密度：(1)簡單立方晶體(simple cubic crystal)、(2)體心立方晶體(BCC crystal)、(3)面心立方晶體(FCC crystal)。 (9%)
3. 下列金屬晶體受到塑性變形時，請列出其滑動系統(slip system)。 (8%)
  - (a) 面心立方單晶(FCC single crystal)
  - (b) 體心立方單晶(BCC single crystal)
4. (a) Scheme microstructures of pearlite and spheroidite. (4%)  
(b) Which one is more stable between pearlite and spheroidite? (2%) How do you know it is more stable than the other? (2%) How do you conduct a phase transformation between the pearlitic and spheroiditic steel? (2%)
5. (a) Define the eutectic, peritectic and eutectoid reactions for the binary system. (6%)  
(b) Rank the following iron-carbon alloys and associated microstructures from the highest to the lowest tensile strength: (4%)
  - 0.25 wt%C with spheroidite
  - 0.25 wt%C with coarse pearlite
  - 0.6 wt%C with fine pearlite
  - 0.6 wt%C with coarse pearlite.
6. Describe the difference in the temperature dependence of resistivity for copper (Cu) and intrinsic silicon (Si). Explain why? (10%)
7. 試說明(a)切削刀具的刀鼻半徑，(b)進給速度與工件表面粗糙度的關係，及三者間的理論關係式如何？ (10%)
8. 試比較說明高速度鋼刀具與陶瓷刀具的特徵。 (10%)
9. 試說明磨粒在研磨加工中的三種加工行為。 (5%)
10. Using photolithography and semiconductor manufacturing processes to make small structures is becoming more popular. Briefly describe its typical advantages and disadvantages (or limitations) compared to the traditional manufacturing processes. (10%)
11. Silicon dioxide ( $\text{SiO}_2$ ) thin films are important materials in semiconductor fabrication.
  - (a) Briefly describe three different methods to deposit or grow  $\text{SiO}_2$  thin films. (5%)
  - (b) Compare the above three methods. (5%)
  - (c) Briefly describe two different methods to etch  $\text{SiO}_2$  thin films. (5%)

