國立中山大學108學年度
碩士暨碩士專班招生考試試題

科目名稱：材料科學【材料前瞻應材碩士班丙組】

—作答注意事項—

考試時間：100分鐘

- **考試開始響前不得翻閱試題，並不得書寫、劃記、作答。**請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- **答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示**，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，不得另攜帶紙張，請衡酌作答。
- 答案卡請以2B鉛筆劃記，不可使用修正液（帶）塗改，未使用2B鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，其後果由考生自行負擔。
- 答案卷（卡）應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）入場。
- **試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。**
- **試題採雙面列印，考生應注意試題頁數確實作答。**
- **違規者依本校招生考試試場規則及違規處理辦法處理。**

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科目名稱：材料科學【材料前瞻應材碩士班丙組】　　題號：487004

※本科目依簡章規定「不可以」使用計算機(問答申論題)　　

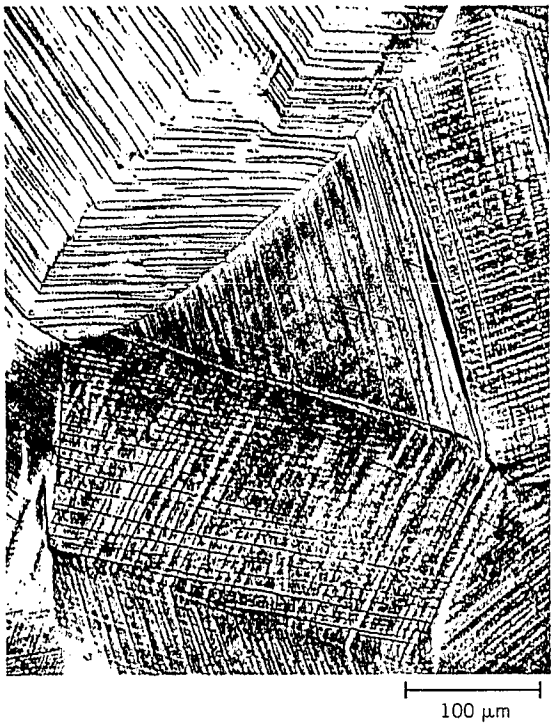
(1) For hexagonal crystals, Miller indices and Miller-Bravais indices can both be used to express directions and planes. Explain why two kinds of indices are used? 5 points

(2) For diffusion in crystals to occur, an activation energy is required. (a) Explain the meaning of the activation energy of a diffusion process. (b) Explain why in most systems, the activation energy for interstitial diffusion is often lower than that for substitutional diffusion. 5 points each, 10 points

(3) (a) Why the tensile fracture strain of a metal is always less than the compressive fracture strain? (b) Why the ultimate tensile strength of a material is defined as the stress at the maximum load during a tensile test? 4 points each, 8 points

(4) Explain the following terms: (a) Anisotropy, (b) Schmid factor, (c) Fermi surface, (d) Ferromagnetism, (e) Semi-coherent interface boundary, (f) CCT diagram. 5 points each, 30 points

(5) This figure showing the slip lines on the surface of a polycrystalline copper that was polished and subsequently deformed. Discuss this figure. 6 points



(6) Give a schematic drawing of the solidification structure of a peritectic reaction under fast cooling rate. Equilibrium state is not obtained under the fast cooling rate. Explain your drawings. 6 points

試題請隨卷繳回

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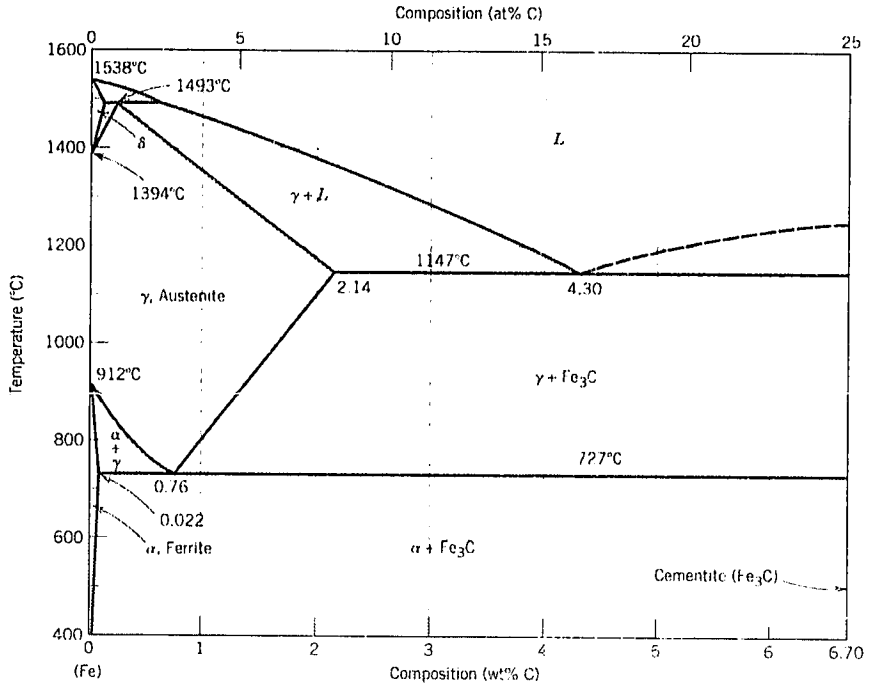
(7) Sketch the structures of (a) 0.4 wt% carbon steel, (b) 0.8 wt% carbon steel, and (c) 1.1 wt% carbon steel, that you would expect to see under an optical microscope. Label the phases and any other features of interest. These steels have been cooled slowly from 1000°C.

3 points each, 9 points



(8) For some substitutional solid solutions, an ordered phase (superlattice) is formed below a certain temperature (T_o), and a disordered phase is formed above T_o. Explain the reason for this?

6 points

(9) Under what condition(s) dynamic strain aging can occur in metals. 5 points

(10) The solidification process of a material can occur at a temperature well below its melting point, what is the reason for this? 5 points

(11) Viscosity is used to measure the resistance to deformation of a noncrystalline material. How viscosity is defined? And what is the unit of viscosity? 5 points.

(12) Draw a typical creep curve of strain versus time at constant load and constant elevated temperature. Explain your drawing. 5 points