

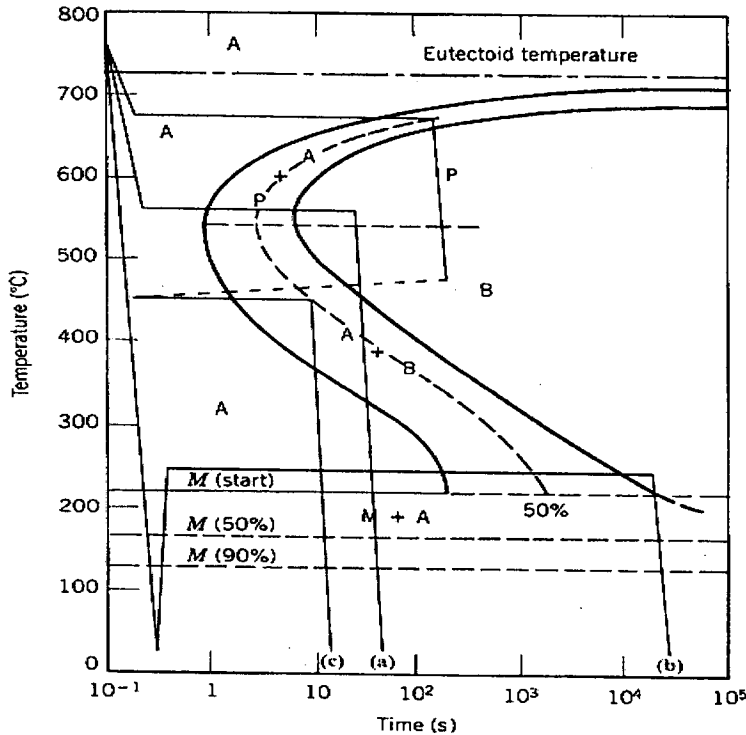
國立中央大學100學年度碩士班考試入學試題卷

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 2 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

材料導論(50分)

1. The following figure shows an isothermal transformation diagram of Fe-C alloy with eutectoid composition. Please answer the following two questions based on the information provided in this figure.

- (1) What is the micro-structure for the time-temperature path (a). (2%)
- (2) What is the micro-structure for the time-temperature path (b). (3%)
- (3) What is the micro-structure for the time-temperature path (c). (5%)

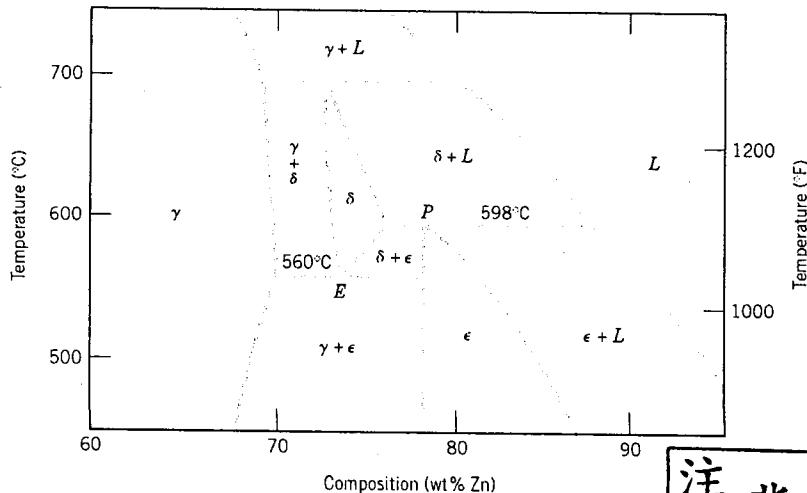


2. For a 99.6 wt% Fe-0.40 wt% C steel at a temperature just below the eutectoid, the compositions of Fe_3C , ferrite (α) and eutectoid-point are 6.70wt%, 0.022wt% and 0.76wt%, respectively.

- (1) What is the amount of cementite (in grams) that forms in 100 g of steel? (4%)
- (2) What are the amount of proeutectoid ferrite (α) in the 100 g of steel? (5%)

3. The following figure show a portion of the Cu-Zn phase diagram.

- (1) What is the point E as shown in the figure? (2%)
- (2) Please write down the 3-phase reaction equation for point E, including compositions and temperatures. (5%)



參考用

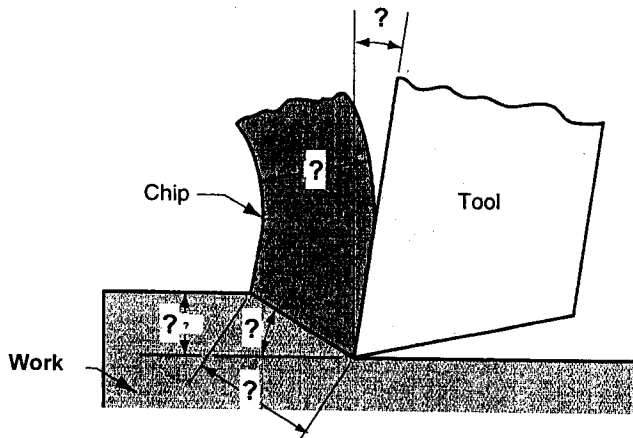
注意：背面有試題

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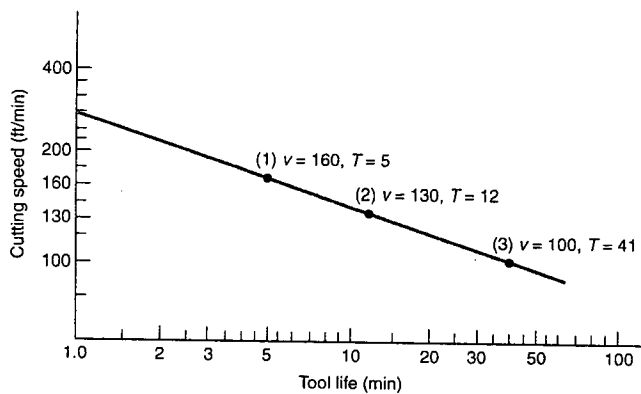
4. Please write down the slip systems probably be activated during plastic deformation in:
 - (1) FCC single crystal (3%)
 - (2) BCC single crystal (3%)
 - (3) HCP single crystal (3%)
5. Explain why some metals (e.g., lead and tin) cannot be strain hardened at room temperature? (5%)
6. Why the Magnesium and Zinc only can be fabricated by casting instead of forging? (5%)
7. Cite one reason why ceramic materials are, in general, harder and more brittle than metals. (5%)

機械製造 (50 分)

8. 切削加工的受力分析常以二維之 orthogonal cutting 簡化。請參考下圖 orthogonal cutting 之二維分析模型，(a)填入重要分析參數 ϕ 、 α 、 t_c 、 t_0 、 l_s 並說明其所代表之意義。(5%)



- (b) 請定義 chip thickness ratio, r 。(2%)
- (c) 請以 chip thickness ratio, r 來表示 shear plane angle (3%)及 shear strain (5%)
- (d) 刀具壽命為切削加工中重要的設計考量，下圖為一實驗結果，請說明(1)(2)(3)點所代表涵義?(5%)
 你可以歸納出其關係式嗎?(5%)



參考用

9. Which of the following are the typical doping processes in IC fabrication (two best answers): (a) chemical vapor deposition, (b) diffusion, (c) ion implantation, (d) physical vapor deposition, (e) Reactive Ion Etching, or (f) thermal oxidation? (5%)
10. In photolithography:
 - (1) How does the wavelength of the light source affect the resolution of the patterns? (5%)
 - (2) What are the two major factors related to the exposure tools that affect the resolution of the patterns? (5%)
11. (1) What are the wet etching and dry etching in IC fabrication? (5%)
 (2) List three most important factors that affect the wet etching rate. (5%)

注意：背面有試題