

國立臺北科技大學九十七學年度碩士班招生考試

系所組別：3302 材料科學與工程研究所不分組

第二節 物理冶金 (選考) 試題

填准考證號碼

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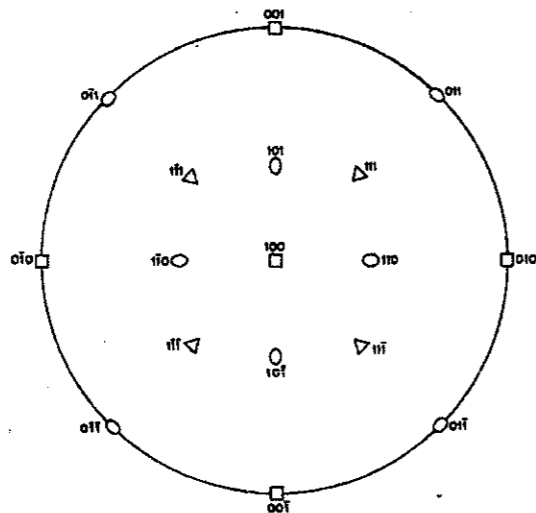
第一頁 共二頁

注意事項：

1. 本試題共七題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、For a 100 standard projection of a cubic crystal, answer below questions

1. Please plot the (111) as well as the great circle corresponding to this plane. (3%)
2. Please mark the three <110> slip directions on the (111) great circle. (3%)
3. Please plot the possible of the [310] direction on the standard projection. (4%)
4. If a tensile stress is applied along the [310] direction, what would be the magnitude of the Schmid factor ($\cos\theta \cos\phi$) for the (111)[10 $\bar{1}$] slip system with this stress axis orientation. (5%)



二、

1. The Iron containing small quantities of sulphur will become brittle at high temperature. Please explain the reason. (5%)

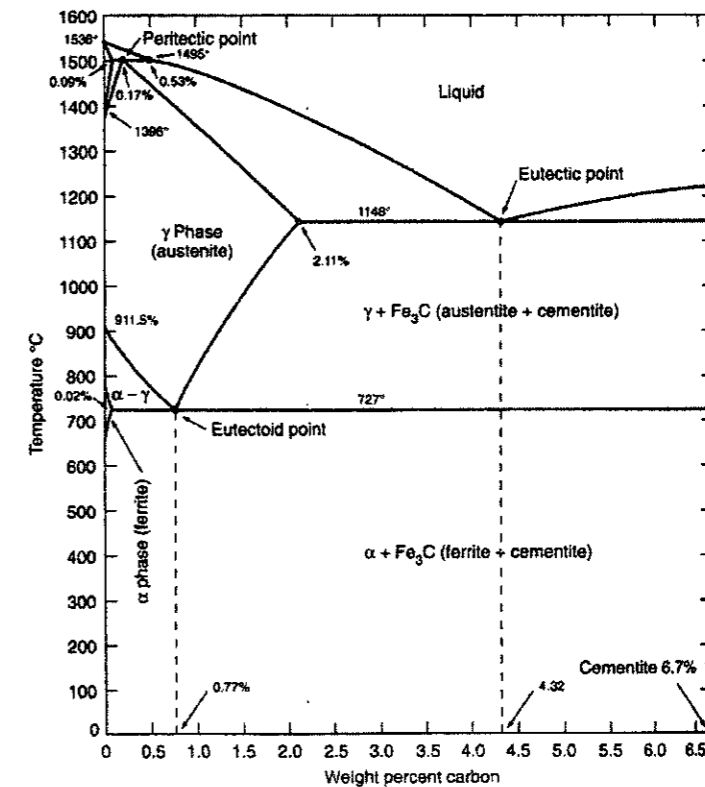
2. The iron sulfide don't occur the "hot short" below approximately 1000°C. Please explain the reason. (5%)
3. How to avoid the "hot short" in steel? (5%)

三、Explain the items

1. Lüders bands (5%)
2. strain aging (5%)
3. Hall-Petch equation (5%)
4. Kirkendall effect (10%)

四、After being slowly cooled from the austenite region, a simple iron-carbon steel exhibits a microstructure consisting of 40 percent pearlite and 60 percent ferrite.

1. Estimate the carbon concentration of the steel. (5%)
2. Describe the microstructure that would be obtained if the steel were heated to 730°C and held there for a long period of time. (3%)
3. What would be the equilibrium structure of this steel if it were heated to 850°C? (2%)



注意：背面尚有試題

五、For the F.C.C. crystal structure, please rank these planes (100), (110), and (111) in order of their growth velocity during freezing and explain the reason. (10%)

六、Please describe that dendritic growth in pure metal during solidification. (10%)

七、

1. Please define the fatigue failures (5%)
2. And describe the process and macroscopic character of fatigue failures (10%).