國立成功大學

110學年度碩士班招生考試試題

編　號：69

系　所：機械工程學系

科　目：機械製造及材料

日　期：0202

節　次：第 2 節

備　註：可使用計算機

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※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Explain or distinguish the following terms: (16%)

   (a) Amorphous vs crsystalline　　(b) Fatigue vs Creep

   (c) Anelastic vs viscoelastic deformation　　(d) Polymorphism vs isomerism

2. (a) What is the Schmid's law for plastic deformation in critical resolved shear stress (τ_{CRSS})? (4%)

   (b) Describe how temperature, purity, strain rate and dislocation density affect the τ_{CRSS} respectively. (4%)

   (c) Would you expect a crystalline ceramic material to strain harden at room temperature? Why or why not? (4%)

   (d) Would you expect the metals of (1) lead and (2) iron to strain harden when deformed at room temperature? Why? (4%)

3. (a) What is elastic deformation? What is Poisson's ratio? (6%)

   (b) A cylindrical specimen of a hypothetical metal alloy is stressed in compression. If its original and final diameters are 30.00 and 30.04 mm, respectively, and its final length is 105.20 mm, compute its original length if the deformation is totally elastic. The elastic and shear moduli for this alloy are 65.5 and 25.4 GPa, respectively ($E=2G(1+\nu)$). (12%)

4、說明題 (30%)

4-1. Please explain the difference between TTT and CCT diagram and when to use it (5%).

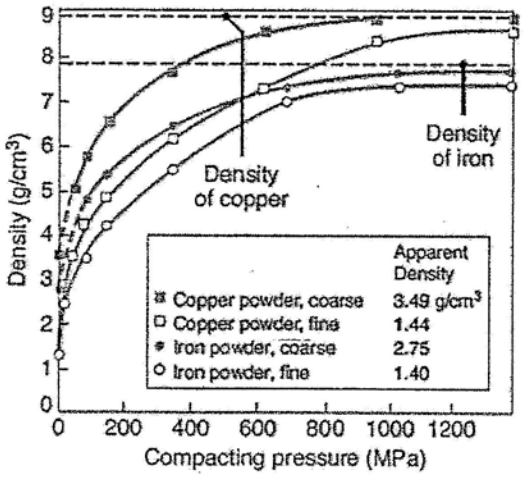
4-2. Please explain the detail definition of toughness, stiffness, and ductility (15%).

4-3. Please explain why Indirect Extrusion is suitable for processing high-strength steel (5%).

4-4. Please describe the carbon content range of wrought iron, low carbon steel, medium carbon steel, high carbon steel, and cast iron (5%).

5、計算題 (20%)

5-1. A gear is to be manufactured from iron powders. It is desired that it have a final density 90% that of cast iron, and it is known that the shrinkage in sintering will be approximately 5%. For a gear that is 90 mm in diameter and has a 15-mm hub, what is the required press force? (10%).



5-2. In orthogonal cutting process, where t_o=0.13 mm, V=120 m/min, α=10°, cutting width is 6 mm, t_c=0.23 mm, Fc=500 N, Ft=200 N. Please calculate the percentage of total energy consumed to overcome the friction between the tool and the chips (10%).