

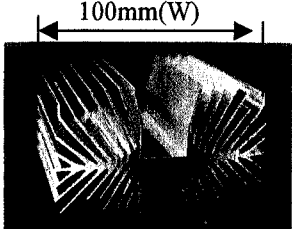
# 淡江大學 101 學年度碩士班招生考試試題

系別：機械與機電工程學系

科目：機 械 製 造

考試日期：2 月 26 日(星期日) 第 2 節

本試題共 10 大題， 1 頁

1. In comparison to material removal processes, what are the advantages and disadvantages of metal forming processes? Briefly explain the effect of working temperature, strain rate, and friction/ lubrication on the outcomes of metal forming processes. (10%)
2. Briefly explain what causes the shrinkage in the casting process and what would you do to minimize it? Can we use the directional solidification to reduce shrinkage? Why? What would you do to achieve directional solidification? (10%)
3. Describe how degree of polymerization, molecular weight, cross-linking and degree of crystallinity affect polymer behavior? What causes the material to shrink during the injection molding process and what to do to reduce the shrinkage? (10%)
4. What is nanoimprint? (Briefly explain the processes of press-type nanoimprint, step & repeat type nanoimprint, and roll-to-roll type nanoimprint.) What are the major problems/difficulties involved in the nanoimprint processes? (10%)
5. In comparison to conventional grinding process, what are the advantages and problems of creep-feed grinding? What would you do to minimize these problems? Is it suitable to use creep-feed grinding in machining hard and brittle materials such as  $Al_2O_3$  and WC? (10%)
6. Ceramic and cermet cutting tools have certain advantages over carbide tools. Why, then, are they not completely replacing carbide tools? Describe the reasons for coating cutting tools with multiple layers of different materials. Is it feasible to cut ferrous materials using diamond tools? Explain why? Which tool-material properties are suitable for interrupted cutting operations? Why? (10%)
7. Which process do you think is most suitable to fabricate the aluminum heat sink, shown in the attached picture, having the dimension of 100(W) x50(H) x100(L)mm (minimum fin thickness ~2mm), if (a) just 2 pieces (b) 1,000,000 pieces are required? Explain why?? (10%)  

8. Why does the temperature in cutting depend on the cutting speed, feed, and depth-of-cut? Explain why the percentage of the total cutting energy carried away by the chip increases with cutting speed? Explain the consequences of allowing temperatures to rise to high levels in cutting. (10%)
9. What are the major differences between fusion welding and solid state welding? Briefly explain how power density, heat transfer efficiency and melting efficiency affect the welding process and the resulted HAZ (10%)
10. Briefly explain the following terms/processes (1) chemical-mechanical polishing (CMP) (2) grinding ratio (3) dressing/truing (4) investment casting (5) roughness ( $R_a$ ,  $R_q$ ,  $R_t$ ) (10%)