

本試題是否可以使用計算機:  可使用,  不可使用 (請命題老師勾選)

1. Suggest possible choice of materials and manufacturing processes for the following components. Indicate the economic and property requirements to justify your selection and describe the manufacturing method.
  - (a) machine screw ( 500,000 pieces per year ) (10%)
  - (b) paper clip ( 2,000,000 pieces per year ) (10%)
2. Calculate the work done in frictionless compression of a solid cylinder 40mm height and 20 mm in diameter to a reduction in height of 50% for the annealed 304 stainless steel with flow stress  $\sigma = K \epsilon^n$  where  $K = 1275 \text{ MPa}$ ,  $n = 0.45$ . (15%)
3. Make a list of the independent variables that influence the punch force in deep drawing of a cylindrical cup, and explain why and how the variables influence the punch force. (15%)

(背面仍有題目, 請繼續作答)

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4. Two physical properties that have a major influence on the cracking of workpieces or dies during thermal cycling are thermal conductivity and thermal expansion. Explain why. (5%)
5. Surface roughness design requirements for typical engineering applications can vary by as much as 100 times for different parts. What are the reasons and considerations for this broad range? (5%)
6. (a) Most metals experience shrinkage when they solidify from liquid state. This is not the case for gray cast iron. Explain why. (5%)
- (b) How does the shape of graphite in cast iron affect its properties? (5%)
- (c) Why are steels more difficult to cast than cast irons? (5%)
7. What are the purposes of surface treatments? List three mechanical treatments and two non-mechanical treatments. (5%)
8. List at least five independent input and five dependent output parameters or variables of a cutting process. Illustrate the cutting process with a drawing. (10%)
9. Describe three different types of nontraditional machining processes. Explain when nontraditional machining processes are preferred over traditional processes such as cutting and grinding. What material properties are particularly important in each of these three nontraditional material-removal processes? (10%)