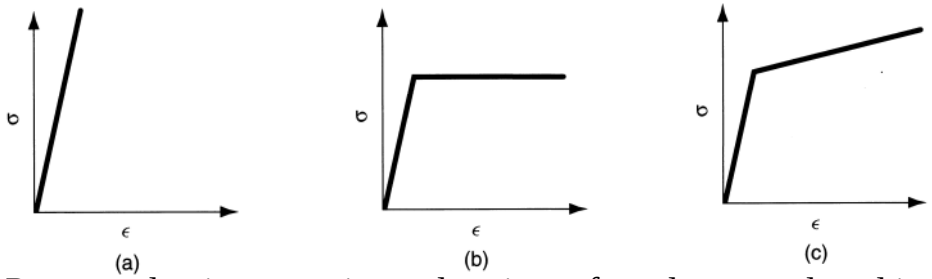
Process and Design for Manufacturing

1st Examination March 28 2008 (11:10am ~ 12:45pm) Close Book

I. Following questions you may answer **Either in Chinese or in English** (60%)

1. Describe the behavior of nearly all types of solid materials, shown in the following three types of stress-strain relationship? (6%)



2. If *Q* and *P* are production quantity and variety of products produced in the plant respectively. What are the relationship of *P* and *Q*? (6%)

3. What are some of the general properties that distinguish metals from ceramics and polymers? (6%)

4. Explain investment casting and why it is sometimes called the lost-wax process? (6%)

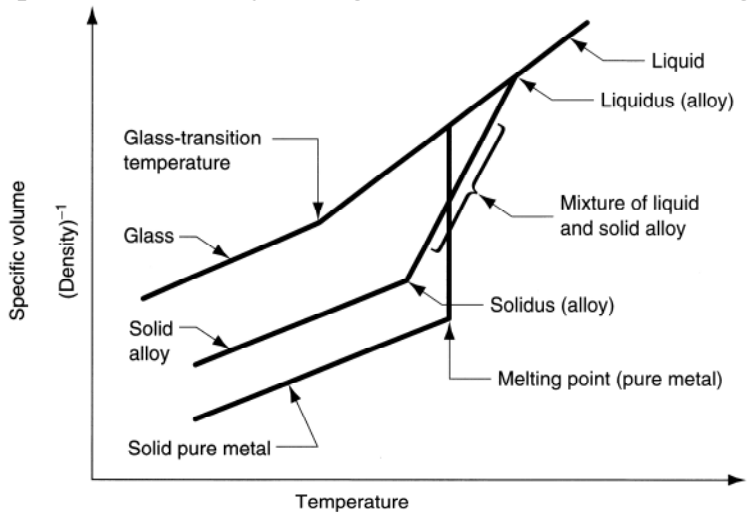
5. Strain hardening also named work hardening, define it and describe why is an important factor in certain manufacturing processes, particularly metal forming? (6%)

6. Physical properties are important in manufacturing. Give 3 physical properties and tell how they influence the performance of the process. (6%)

7. The plain carbon steels are typically classified into three groups according to their carbon content. What are the three groups? (6%)
8. What are the gating system and risers? What functions do they serve? (6%)

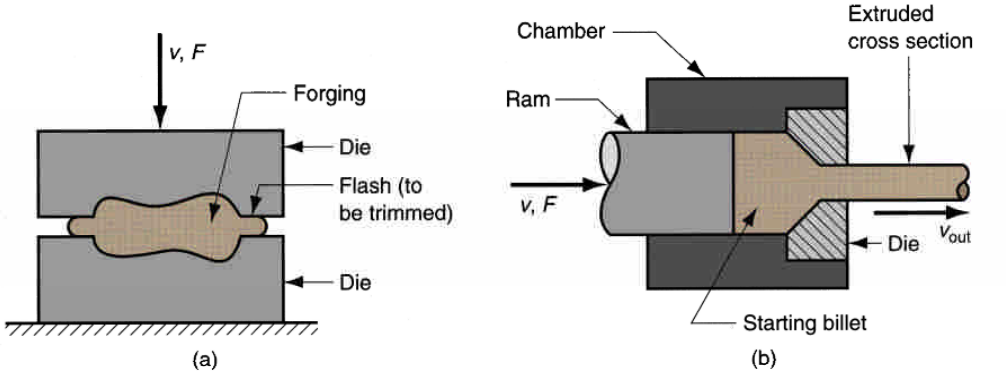
9. What are the three basic methods by which metals can be strengthened (enhancement of mechanical properties in metals)? (6%)

10. In following figure, the plots show changes in density as a function of temperature for three hypothetical materials: a pure metal, alloy, and glass. Describe the melting characteristics in brief. (6%)

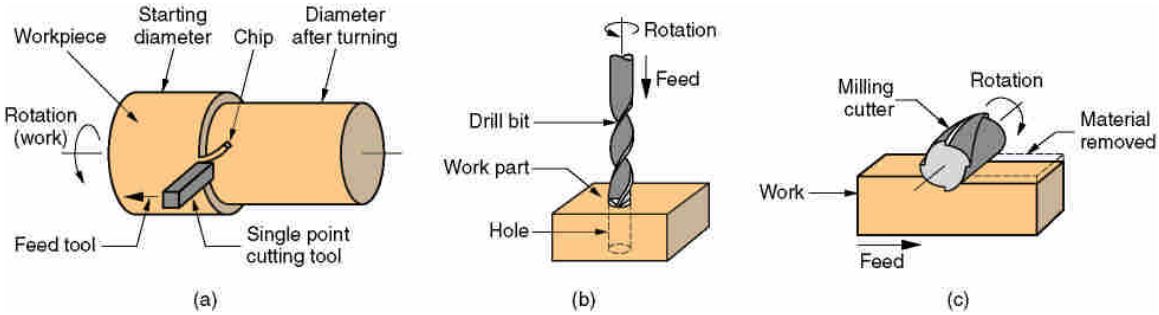


II. Answer following questions in **English Only**, 2 point for each blank. (40%)

1. Two Categories of Metal Casting Processes: __(1)__ and __(2)__ mold processes.
2. Production systems can be divided into two categories: (1) production facilities and (2) __(3)__ support systems.
3. The most common tensile-test procedure is used for studying the __(4)__ relationship, particularly for metals.
4. Manufacturing capability includes: __(5)__ processing capability, Physical product limitations, and __(6)__ capacity
5. Most engineering materials can be classified into one of three basic categories: __(7)__, __(8)__, and __(9)__.
6. Processing of ceramics can be divided into two basic categories: Molten ceramics and __(10)__ ceramics.
7. Alters a workpart's shape, physical properties, or appearance in order to add value to the material called __(11)__ operations.
8. Shaping operations can be divided into four categories: __(12)__ processes, particulate processing, __(13)__ processes, and __(14)__ processes.
9. In following deformation processes figures, please named (a) is __(15)__ operation and (b) is __(16)__ operation.



10. In material removal applications, named following operations, (a) is __(17)__ operation, (b) is __(18)__ operation and (c) is __(19)__ operation.



11. Stress-Strain can be categorized into a. Perfectly elastic, b. Elastic and perfectly plastic and c. __(20)__.