國立虎尾科技大學　機械與機電工程研究所

98 學年度第 1 學期　博士班資格考 【機械製造】

一、解釋名詞：（請寫出中文名詞，並詳細說明其意義、5%）

1-1. Plastic deformation

1-2. Work hardening

1-3. Ultimate tensile strength

1-4. hot working of metal

1-5. Closed-die forging

1-6. Formability

1-7. Spring-back effect

1-8. Heat affected zone (HAZ)

1-9. Build-up edge (BUE)

1-10. Cold extrusion

二、問答題：(除了計算題外，請繪圖並加以文字詳細說明、10%)

2-1. A cylinder with a diameter of 25 mm and height of 75 mm solidifies in three minutes in a sand casting operation. What is the solidification time if the cylinder height is doubled? What is the time if the diameter is doubled? (Assume n=2)

Hint: solidification time $= C\left(\frac{\text{volume}}{\text{surface area}}\right)^n$, where C is a constant.

2-2. What is investment casting process?

2-3. Estimated the force required for punching a 25-mm diameter hole through a 3.2-mm thickness annealed titanium-alloy Ti-6Al-4V sheet at room temperature.

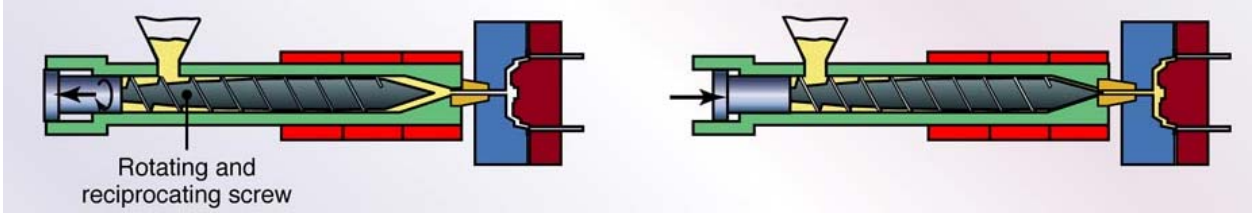
Hint: maximum punch force, $F = 0.7 \times T \times L \times UTS$, where T is thickness, L is total length sheared, and UTS is the ultimate tensile strength.

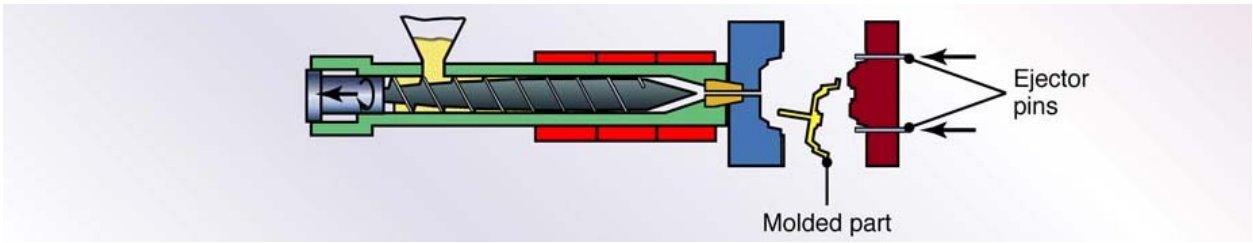
Properties and Typical Applications of Selected Wrought Titanium Alloys at Various Temperatures

Nominal composition (%)	UNS	Condition	Ultimate tensile strength (MPa)	Yield strength (MPa)	Elongation (%)	Reduction of area (%)	Temp. (°C)	Ultiamte tensile strength (MPa)	Yield strength (MPa)
99.5 Ti	R50250	Annealed	330	240	30	55	300	150	95
5 Al, 2.5 Sn	R545200	Annealed	860	810	16	40	300	565	450
6 Al, 4V	R56400	Annealed	1000	925	14	30	300	725	650
		Solution + age	1175	1100	10	20	300	980	900
13 V, 11 Cr, 3 Al	R58010	Solution + age	1275	1210	8	-	425	1100	830

2-4. Illustrate and explain the tube-drawing process.

2-5. Explain the process illustrated below and discuss the influence parameters.




Ejector
pins
Molded part