

國立虎尾科技大學機械與機電工程研究所博士班資格考試試題

科目名稱：機械製造

2008/05

班級：\_\_\_\_\_ 學號：\_\_\_\_\_ 姓名：\_\_\_\_\_ 成績：

1. Describe the methods used for producing single-crystal parts. (10%)
2. Explain the difference between open-die and impression-die forging? (10%)
3. Describe briefly the production steps involved in making powder-metallurgy parts. (10%)
4. What are the major requirements for cutting-tool materials? (10%)
5. State whether you would set the height of the tool in a turning operation at the center of the workpiece, a little above it, or a little below it. Explain why. (10%)
6. Explain what is meant by a grinding wheel acting soft or hard. (10%)
7. Why has electrical-discharge machining become so widely used? (10%)
8. Explain what is meant by solid-state welding. (10%)
9. Why are surface roughness design requirements in engineering so broad? (10%)
10. Explain the principle of an air gage. What advantages do they have over other types of gages? (10%)

國立虎尾科技大學 機械與機電工程研究所  
97 學年度第 2 學期 博士班資格考 【機械製造】

1. 解釋名詞:
  - (a) 刀口積屑(BUE), 5%
  - (b) 層加工(Layer manufacturing), 5%
  - (c) 延性材料(Ductile), 5%
  - (d) 回彈效應(Spring-back effect), 5%
2. 請繪圖說明無縫管件製造的方法(20%)
3. 請說明常溫加工與低溫加工的定義,兩者優缺點的比較(20%)
4. 在非傳統加工中之雷射加工(Laser machining), 請說明其加工的原理與熱影響區(Heat affect zone, HAZ)之影響(20%)
5. 請說明脫模鑄造(investment casting)的原理與優點(20%)

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  $n=2$ )

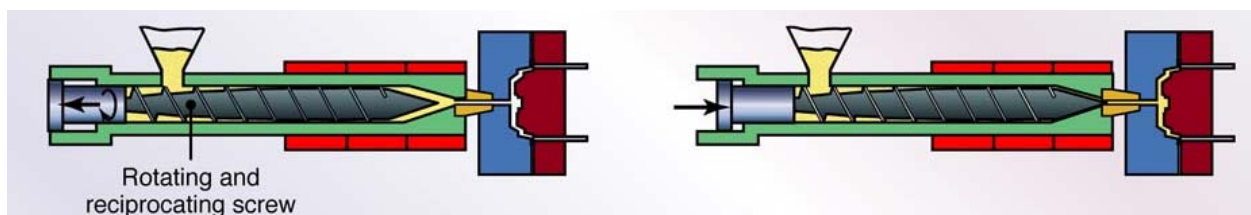
Hint: solidification time =  $C \left( \frac{\text{volume}}{\text{surface area}} \right)^n$ , where C is a constant.

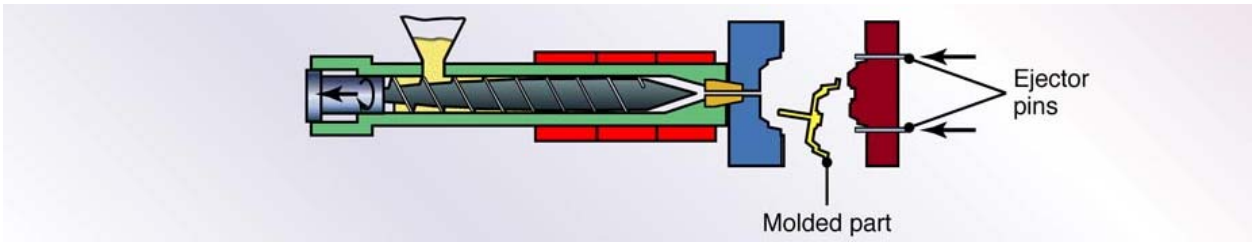
- 2-2. What is investment casting process?
- 2-3. Estimated the force required for punching a 25-mm diameter hole through a 3.2-mm thickness annealed titanium-alloy Ti-6Al-4V sheet at room temperature.  
Hint: maximum punch force,  $F = 0.7 \times T \times L \times UTS$ , where  $T$  is thickness,  $L$  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)	Ultimate 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.





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99 學年度第 1 學期 博士班資格考 【[機械製造](#)】

1. 解釋名詞：
  - (a) Nondestructive testing, 5%
  - (b) Lever rule, 5%
  - (c) Ball milling, 5%
  - (d) Disposable patterns casting, 5%
2. 請繪圖說明五軸加工的原理及其優缺點(20%)
3. 請說明複合材料的種類及其製備的方法(20%)
4. 在非傳統加工中之超音波加工(Ultrasonic machining), 請分別說明壓電材料產生壓電效應的原理、壓電效應、逆壓電效應及超音波加工的種類(20%)
5. 請說明微機電系統中LIGA (Lithographic Gavanoforming Abforming 通常簡稱為深刻電鑄模造技術) 的製程步驟(20%)

一、解釋名詞：（請寫出中文名詞，並詳細說明其意義，25%）

1. Tolerance
2. Brittle Fracture
3. Ductility
4. Spring-back effect
5. Mechanical fibering

二、何謂塑性加工？目前業界常用之塑性加工法有哪幾種？請任選兩種加以簡要說明。（15%）

三、一般金屬鑄件固化成形過程中會有收縮的現象，此收縮的現象可分哪三個階段？此三個階段對鑄件會造成何種效應？（15%）

四、請簡要說明一般傳統粉末冶金製程的三個步驟。（15%）

五、何謂 open-die-forging、impression-die forging 及 flashless forging？請繪簡圖說明。（15%）

六、請以砂模鑄造一個啞鈴為例，簡單繪圖說明砂模之主要特徵。（15%）

# 國立虎尾科技大學 102 學年度第一學期博士班資格考試題

所別：機械與機電工程研究所

第 1 頁 共 1 頁

科目：機械製造

注意事項：

- (1) 本試題共有 7 題，合計一百分。
- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) 禁止使用計算機

1. How do the three concepts of ductility, toughness, and impact toughness compare, and from which tests do they result?(15%)
2. Name and explain imperfections in crystals. (15%)
3. Express the relationship between tensile yield strength and grain size. (15%)
4. What are the four basic powder metallurgy operations? (15%)
5. What are unilateral and bilateral tolerancing? (10%)
6. Why do edges need to be prepared in welding? What does edge preparation mean? (15%)
7. What are the factors to be considered during the selection of a pattern material? (15%)

# 國立虎尾科技大學 103 學年度第一學期博士班資格考試題

所別：動力機械系機械與機電工程博士班

第 1 頁 共 2 頁

科目：機械製造

注意事項：

- (1) 本試題共有 4 題，每題 25 分，合計一百分。
- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) close book

1. Figure 1 indicates some hot tears in castings. Please review each one and offer solutions to avoid them.

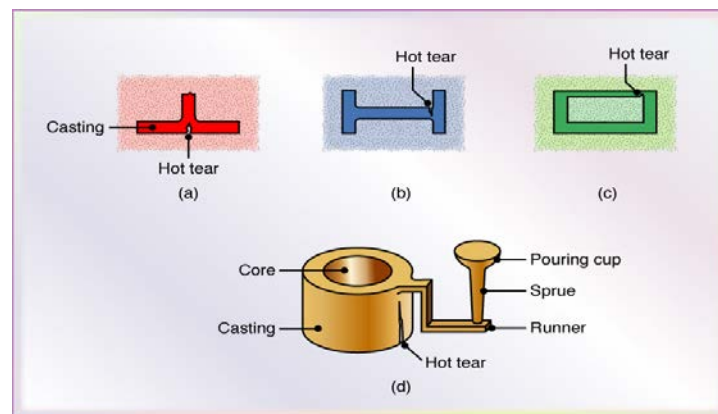


Fig. 1 Hot tears in castings

2. If you need only a few casting parts, which process would you use? Why?
3. Fig. 2 shows a round impression-die forging, made from a cylindrical blank as shown on the left. Please suggest a sequence of intermediate forging steps to make this part and sketch the shape of the dies needed.

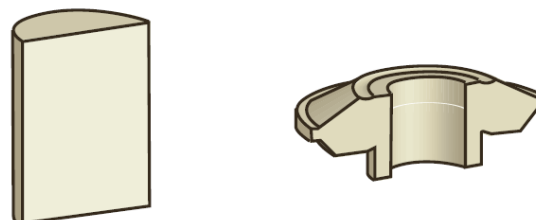


Fig. 2

4. As shown in Fig.3, how would you reduce the surface roughness ?

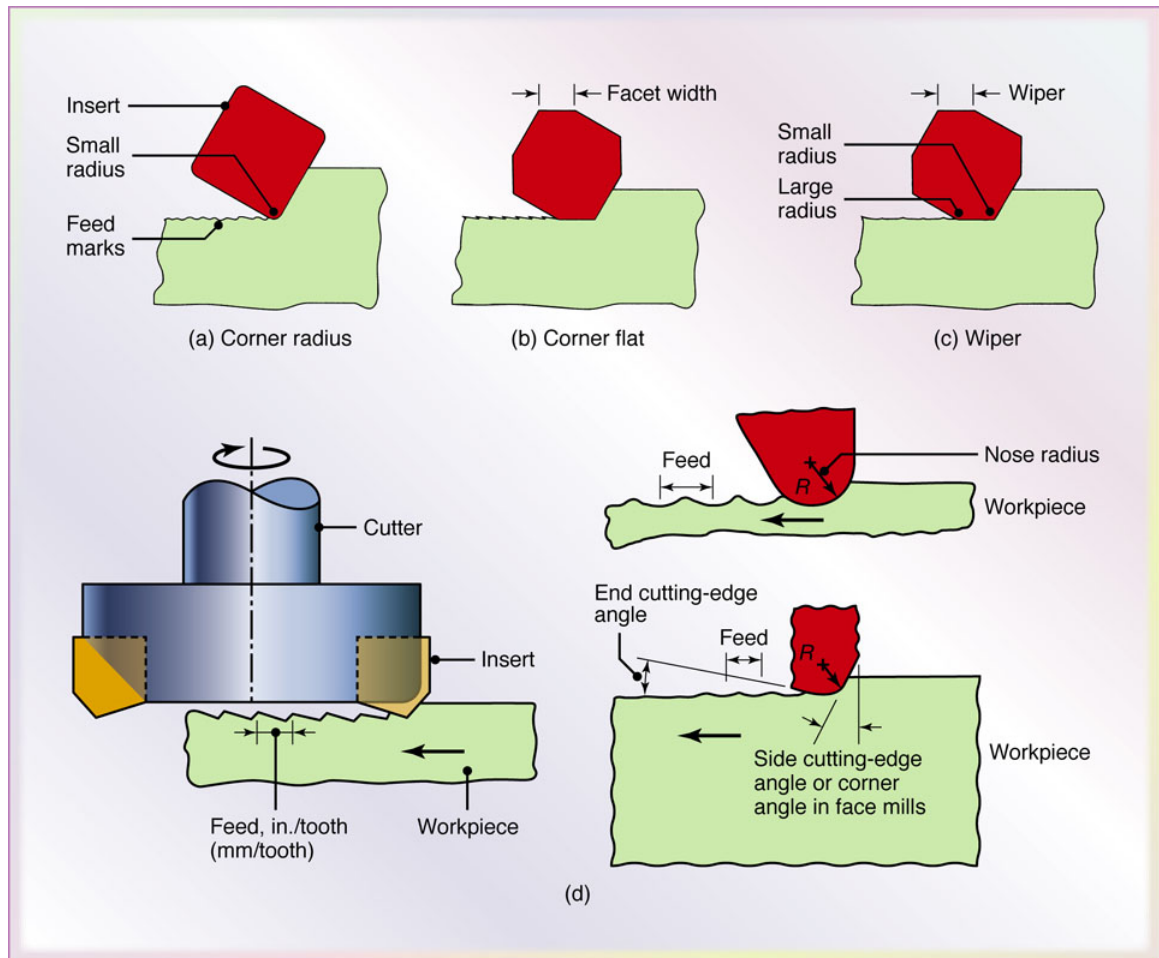


Fig. 3

## 附件一

### 【機械製造】

#### Examination scope

1. Fundamentals of metal casting
2. Metal-casting processes and equipment
3. Metal-forging processes and equipment
4. Machining processes

## **5. Gear manufacturing**

### **Reference books**

1. Manufacturing Engineering & Technology. Manufacturing Engineering and Technology, 7th ed.  
S. Kalpakjian and S.R. Schmid.

# 國立虎尾科技大學 103 學年度第二學期博士班資格考試題

所別：動力機械系機械與機電工程博士班

第 1 頁 共 1 頁

科目：機械製造

**注意事項：**

- (1) 本試題共有 6 題，全部作答，合計一百分。
- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) 可使用計算機，close book。

1. What is ductility, and how is it measured? (10%)
2. In the stress-strain curve equation  $\sigma = K \varepsilon^n$ , what does the exponent  $n$  signify? What does it behave when  $n = 0$  and  $n = 1$ ? (15%)
3. What are the elements of a gating system of a casting pattern? (15%)
4. Please name and simply describe five kinds of major weld defects. (10%)
5. The engineering load-strain diagram shown in the Fig.1 was obtained from a tensile test on a specimen having an initial diameter of 12.0 mm. The diameter of fractured neck at point 2 was 6.25 mm. (i) Determine the true stress  $\sigma$  (Mpa) and true strain  $\varepsilon$  at point 1 and 2. (ii) Determine the value of the parameters  $n$  and  $K$  of the relationship  $\sigma = K \varepsilon^n$ . (25%)
6. A wire is drawn through a conical die shown as Fig.2-1 and Fig.2-2. If the friction is neglected. It is reduced from the initial diameter  $d_0$  of 11 mm to the final diameter  $d_1$  of 6 mm. If the yield strength formula is  $Y = Y_0 + K\varepsilon = 280 + 320\varepsilon$ ,  $v_d = 4\text{mm/sec}$ ,  $\rho c = 3.7(\text{N/mm}^2\text{C})$ . Determine  $\varepsilon_1$ ,  $Y_0(\text{N/mm}^2)$ ,  $Y_1(\text{N/mm}^2)$ ,  $F_d(\text{N})$ , and the drawing power  $P(\text{kW})$ . (25%)

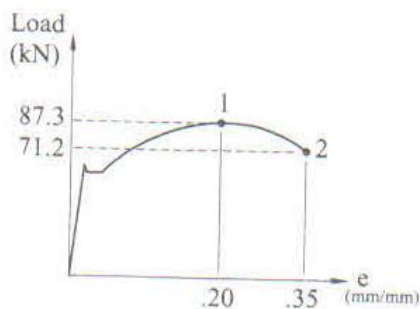


Fig.1

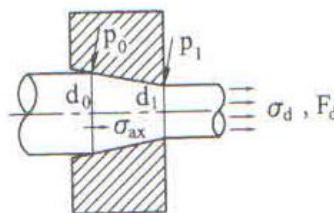


Fig.2-1

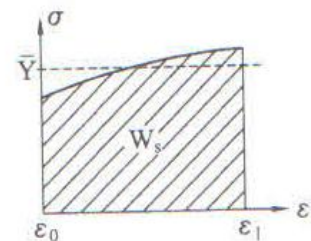


Fig.2-2

國立虎尾科技大學 107 學年度第一學期博士班資格考試題

所別：動力機械系機械與機電工程博士班

第 1 頁 共 1 頁

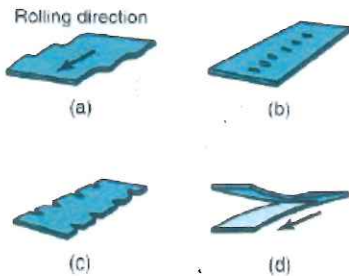
科目：機械製造

注意事項：（1）本試題共有 5 題，全部作答，合計一百分。（2）請依序作答於答案卷上並註明題號。（3）不可使用計算機，close book。

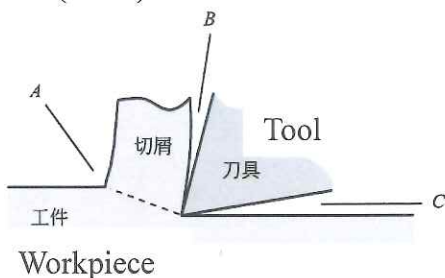
- (a) Please explain the formation and destruction of BUE (Built-up Edge) in cutting process. (10%)

(b) If you hope to reduce the tendency for BUE formation, what you can do? (10%)
- (a) Please draw the pictures to show the climb milling and conventional milling. (10%)

(b) What are the differences between the two methods (climb milling and conventional milling) applied in the face milling? (10%)
- Please explain quenching, tempering, and annealing. (20%)
- The following figure (a)~(d) shows the defects in rolled plates and sheets. Why the defects are happened? (20%)



- The cutting fluids might be applied in 3 different directions shown in the following figure. Please describe the effects caused by different directions in the cutting? (20%)



國立虎尾科技大學 107 學年度第二學期博士班資格考試題

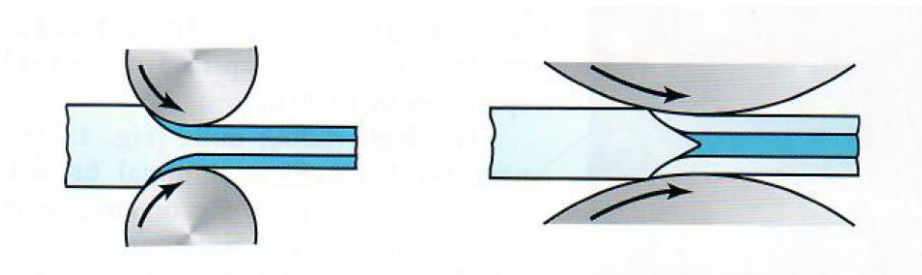
所別：動力機械系機械與機電工程博士班

第 1 頁 共 1 頁

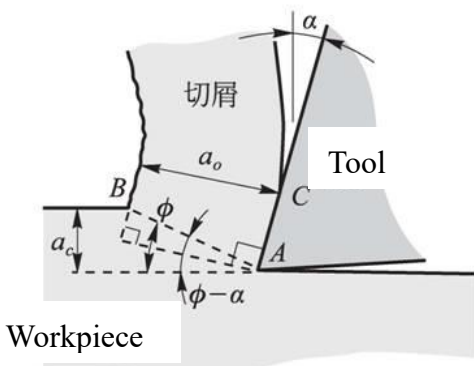
科目：機械製造

注意事項：（1）本試題共有 5 題，全部作答，合計一百分。（2）請依序作答於答案卷上並註明題號。（3）不可使用計算機，close book。

1. (a) Please show the indenters of Brinell Test, Vickers Test, and Rockwell Test. (10%)  
(b) Please show the symbols of the mentioned test shown in (a). (10%)
2. (a) Please explain the use of chip breaker. (10%)  
(b) Please show two types of chip breaker. (10%)
3. Please briefly show the manufacturing process of investment-casting (lost-wax) process. (20%)
4. In cold rolling of plates shown in the following figures, please draw the distribution of residual stresses of the two figures. (20%)



5. The orthogonal cutting shown in the following figure, please derive the relationship between cutting ratio ( $a_c/a_0$ ) and the shear angle  $\phi$ .  $\alpha$  is the rake angle. (20%)



# 國立虎尾科技大學 108 學年度第一學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

第 1 頁 共 1 頁

科目：機械製造

注意事項：

- (1) 本試題共有 5 題，每題 20 分，合計一百分。
- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) **禁止使用計算機/close book**

- 1. Explain the processing steps and uses of metal injection molding will be described?**
- 2. Explain the principle, advantages and disadvantages of electrical discharge machining?**
- 3. Explain the effects of hot forging, cold forging and warm forging on the shape and material properties of the product?**
- 4. What is the purpose of case hardening? Explain the processing steps of case hardening?**
- 5. Please draw and explain the principles of flat rolling processing?**

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系別：動力機械工程系機械與機電工程博士班

第 1 頁 共 1 頁

科目：機械製造

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- (1) 本試題共有 5 題，每題 20 分，合計一百分。
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- (3) 可使用計算機/close book

1. Explain the main construction and transmission steps of the indexing head?
2. What is the principle of punching shear processing? What kinds are there?
3. Discuss some of the defects that can occur in plastic injection molding?
4. What are the principal methods used to produce metallic powders?
5. A tensile test uses a test specimen that has a gage length of 50 mm and an area = 200 mm<sup>2</sup>. During the test the specimen yields under a load of 98,000 N. The corresponding gage length = 50.23 mm. This is the 0.2 percent yield point. The maximum load of 168,000 N is reached at a gage length = 64.2 mm. Determine (a) yield strength, (b) modulus of elasticity, and (c) tensile strength. (d) If fracture occurs at a gage length of 67.3 mm, determine the percent elongation. (e) If the specimen necked to an area = 92 mm<sup>2</sup>, determine the percent reduction in area.

# 國立虎尾科技大學 109 學年度第二學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

第 1 頁 共 1 頁

科目：機械製造

注意事項：

- (1) 本試題共有 5 題，每題 20 分，合計一百分。
- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) 可使用計算機/close book

1. What are the three mechanisms of grinding wheel wear?
2. Discuss some of the defects that can occur in plastic injection molding?
3. What is the purpose of case hardening? Explain the processing steps of case hardening?
4. What is the principle of punching shear processing? What kinds are there?
5. Explain the principle, advantages and disadvantages of electrical discharge machining?

# 國立虎尾科技大學 110 學年度第一學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

第 1 頁 共 1 頁

科目：機械製造

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- (3) **close book**

- 1. Explain the effects of hot forging, cold forging and warm forging on the shape and material properties of the product?**
- 2. Explain the processes and applications of plastic injection molding?**
- 3. What are the principal methods used to produce metallic powders?**
- 4. What is the technical difference between blending and mixing in powder metallurgy?**
- 5. What are the three mechanisms of grinding wheel wear?**

# 國立虎尾科技大學 110 學年度第二學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

第 1 頁 共 1 頁

科目：機械製造

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- (3) **可使用工程計算機/close book.**

1. A heat source transfers 3000 W to the surface of metal part. The heat impinges the surface in circular area, with intensities varying inside the circle. The distribution is as follows: 70% of the power is transferred within a circle of diameter= 5 mm, and 90% is transferred within a concentric circle of diameter= 12 mm. What are the power densities in (a) the 5 mm diameter inner circle and (b) the 12 mm diameter ring that lies around the inner circle?
2. A mold sprue length: 20 cm, and the cross-sectional area at its base: 2.5 cm<sup>2</sup>. The sprue feeds a horizontal runner leading into a mold cavity whose volume is 1560 cm<sup>3</sup>. Calculate: (a) velocity of the molten metal at the base of the sprue, (b) volume rate of flow, and (c) time to fill the mold.
3. A tensile test uses a test specimen that has a gage length of 50 mm and an area = 200 mm<sup>2</sup>. During the test the specimen yields under a load of 98,000 N. The corresponding gage length = 50.23 mm. This is the 0.2 percent yield point. The maximum load of 168,000 N is reached at a gage length = 64.2 mm. Determine (a) yield strength, (b) modulus of elasticity, and (c) tensile strength. (d) If fracture occurs at a gage length of 67.3 mm, determine the percent elongation. (e) If the specimen necked to an area = 92 mm<sup>2</sup>, determine the percent reduction in area.
4. A steel part with surface area  $A= 125 \text{ cm}^2$  is to be nickel-plated (the cathode efficiency for nickel is  $E= 0.95$  and the plating constant  $C= 3.42 \times 10^{-2} \text{ mm}^3/\text{amp-s}$ ). What average plating thickness will result if 12 amps applied for 15 min in acid sulfate electrolyte bath?
5. A gas tungsten arc-welding operation is performed at current of 300 A and voltage of 20 V. The heat-transfer factor  $f_1= 0.7$ , the melting factor  $f_2= 0.5$ , and the unit melting energy for the metal  $U_m = 10 \text{ J/ mm}^3$ . Calculate (a) power in the operation, (b) rate of heat generation at the weld, and (c) volume rate of metal welded.

# 國立虎尾科技大學 111 學年度第一學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

第 1 頁 共 1 頁

科目：機械製造

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- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) **可使用工程計算機/close book.**

1. Explain the principle, advantages and disadvantages of electrical discharge machining?
2. In a tensile test, two pairs of values of stress and strain were measured for the specimen metal after it had yielded: (1) true stress = 217 MPa and true strain = 0.35, and (2) true stress = 259 MPa and true strain = 0.68. Based on these data points, determine the strength coefficient and strain-hardening exponent.
3. A round disk of 150 mm diameter is to be blanked from thickness of 3.2 mm, half-hard cold-rolled steel whose shear strength = 310 MPa, the clearance allowance  $A_c = 0.075$ . Calculate (a) the appropriate punch and die diameters and (b) blanking force.
4. An ECM operation used to cut a hole into a plate of aluminum that is 12 mm thick (specific removal rate  $C$  for aluminum =  $3.44 \times 10^{-2} \text{ mm}^3/\text{A}\cdot\text{s}$ ). The hole has a rectangular cross section = 10 mm x 30 mm. The ECM operation will be accomplished at current = 1200 amps. Efficiency expected to be 95%. Calculate the feed rate and time required to cut through the plate.
5. In a machining operation that approximates orthogonal cutting, the cutting tool has a rake angle =  $10^\circ$ . The chip thickness before the cut  $t_o = 0.5$  mm and the chip thickness after the cut  $t_c = 1.125$  mm. Calculate the shear plane angle and the shear strain in the operation.

# 國立虎尾科技大學 111 學年度第二學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

第 1 頁 共 1 頁

科目：機械製造 Mechanical Manufacturing

注意事項：

- (1) 本試題共有 5 題，每題 20 分，合計一百分。
- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) **可使用工程計算機/close book.**

1. What are the principal methods used to produce metallic powders?
2. What properties determine the quality of a sand mold for sand casting?
3. The power source in a particular welding setup generates 3500 W that can be transferred to the work surface with a heat transfer factor= 0.7. The metal to be welded is low carbon steel, whose melting temperature (1760 °K). The melting factor in the operation is 0.5. A continuous fillet weld is to be made with a cross-sectional area= 10 mm<sup>2</sup>. Calculate the travel speed at which the welding operation can be accomplished.
4. A sheet metal blank is to be bent as shown in figure. The metal has a modulus of elasticity = 205x 10<sup>3</sup> MPa, yield strength = 275 MPa, and tensile strength = 300 MPa. Calculate (a) the starting blank size and (b) the bending force if a V-die is used with a die opening dimension= 25 mm.
5. A 300 mm wide strip 25 mm thick is fed through a rolling mill with two powered rolls each of radius= 250 mm. The work thickness is to be reduced to 22 mm in one pass at a roll speed of 50 rev/min. The work material has a flow curve defined by K= 275 MPa and n= 0.15, and the coefficient of friction between the rolls and the work is assumed to be 0.12. Calculate the roll force, torque, and horsepower.

# 國立虎尾科技大學 112 學年度第一學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

Page 1 / 1

科目：機械製造 Mechanical Manufacturing

## 注意事項：

- (1) 本試題共有 5 題，每題 20 分，合計一百分。
- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) **可使用計算機/閉書考(Engineering calculator is allowable/close book.)**

1. A tensile test uses a test specimen that has a gage length of 50 mm and an area = 200 mm<sup>2</sup>. During the test the specimen yields under a load of 99,000 N. The corresponding gage length = 50.23 mm. This is the 0.3 percent yield point. The maximum load of 180,000 N is reached at a gage length = 64.2 mm. Determine (a) yield strength, (b) modulus of elasticity, and (c) tensile strength. (d) If fracture occurs at a gage length of 68 mm, determine the percent elongation. (e) If the specimen necked to an area = 95 mm<sup>2</sup>, determine the percent reduction in area.
2. A mold sprue length: 30 cm, and the cross-sectional area at its base: 3.5 cm<sup>2</sup>. The sprue feeds a horizontal runner leading into a mold cavity whose volume is 1660 cm<sup>3</sup>. Calculate: (a) velocity of the molten metal at the base of the sprue, (b) volume rate of flow, and (c) time to fill the mold.
3. A round disk of 160 mm diameter is to be blanked from thickness of 3.5 mm, half-hard cold-rolled steel whose shear strength= 330 MPa, the clearance allowance  $A_c=0.085$ . Calculate (a) the appropriate punch and die diameters and (b) blanking force.
4. In a machining operation that approximates orthogonal cutting, the cutting tool has a rake angle= 10°. The chip thickness before the cut  $t_o=0.5$  mm and the chip thickness after the cut  $t_c=1.125$  mm. Calculate the shear plane angle and the shear strain in the operation.
5. A steel tensile specimen with starting gage length = 2.5 in and cross-sectional area = 1.5 in<sup>2</sup> reaches a maximum load of 38,000 lb. Its elongation at this point is 26%. Determine the true stress and true strain at this maximum load.

# 國立虎尾科技大學 112 學年度第二學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

Page 1 / 1

科目：機械製造 Mechanical Manufacturing

## 注意事項：

- (1) 本試題共有 5 題，每題 20 分，合計一百分。
- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) **可使用計算機/閉書考(Engineering calculator is allowable/close book.)**

1. In a tensile test, two pairs of values of stress and strain were measured for the specimen metal after it had yielded: (1) true stress = 217 MPa and true strain = 0.35, and (2) true stress = 259 MPa and true strain = 0.68. Based on these data points, determine the strength coefficient and strain-hardening exponent.
2. A billet length 75 mm and diameter 25 mm to extruded in a direct extrusion operation with extrusion ratio  $r_x = 4$ . The extrudate has a round cross section. The die angle (half-angle) =  $90^\circ$ . The work metal has a strength coefficient = 415 MPa, and strain-hardening exponent = 0.18. Use the Johnson formula with  $a = 0.8$  and  $b = 1.5$  to estimate extrusion strain. Calculate the pressure applied to the end of the billet as the ram moves forward.
3. In a machining operation that approximates orthogonal cutting, if the cutting speed = 100 m/min, chip thickness before the cut ( $t_o$ ) = 0.5 mm, width of cut ( $\omega$ ) = 3 mm, cutting force ( $F_c$ ) = 1557 N. Calculate the cutting power and specific energy.
4. A heat source transfers 3000 W to the surface of metal part. The heat impinges the surface in circular area, with intensities varying inside the circle. The distribution is as follows: 70% of the power is transferred within a circle of diameter = 5 mm, and 90% is transferred within a concentric circle of diameter = 12 mm. What are the power densities in (a) the 5 mm diameter inner circle and (b) the 12 mm diameter ring that lies around the inner circle?
5. A gas tungsten arc-welding operation is performed at current of 300 A and voltage of 20 V. The heat-transfer factor  $f_1 = 0.7$ , the melting factor  $f_2 = 0.5$ , and the unit melting energy for the metal  $U_m = 10 \text{ J/mm}^3$ . Calculate (a) power in the operation, (b) rate of heat generation at the weld, and (c) volume rate of metal welded.

# 國立虎尾科技大學 113 學年度第 1 學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

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科目：機械製造

注意事項：

(1) 本試題共有 4 題，每題 25 分，合計 100 分。

(2) 請依序作答於答案卷上並註明題號。

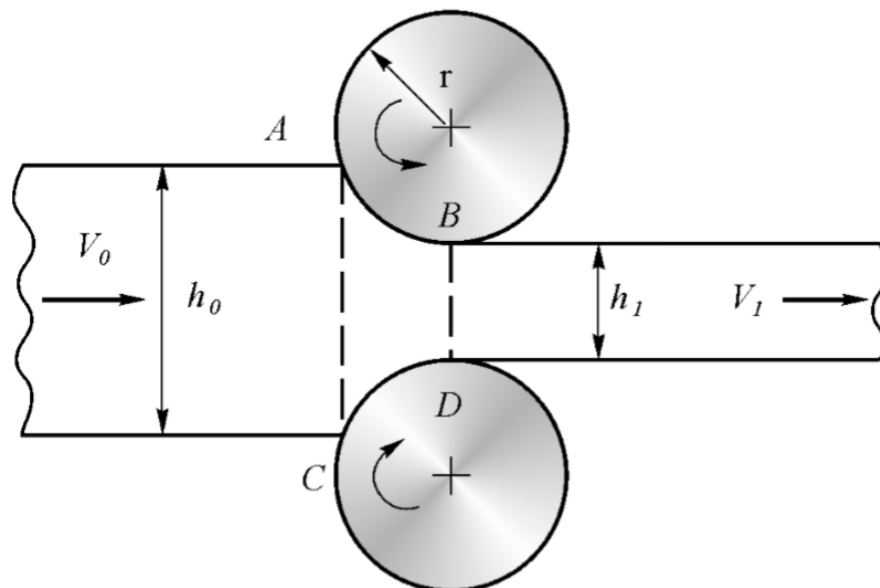
(3) 閉書考、可使用計算機

Close book and Engineering calculator is allowable.

1. Explain the effects of hot forging, cold forging and warm forging on the shape and material properties of the product.

2. What is the purpose of case hardening? Explain the three processing methods of case hardening.

3. Please redraw and explain the principles of flat rolling processing.



# 國立虎尾科技大學 113 學年度第 1 學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

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科目：機械製造

4. A tensile test uses a test specimen that has a gage length of 50 mm and an area = 200 mm<sup>2</sup>. During the test the specimen yields under a load of 98,500 N. The corresponding gage length = 50.22 mm. This is the 0.2 percent yield point. The maximum load of 169,000 N is reached at a gage length = 64.2 mm. Determine (a) yield strength, (b) modulus of elasticity, and (c) tensile strength. (d) If fracture occurs at a gage length of 67.4 mm, determine the percent elongation. (e) If the specimen necked to an area = 93 mm<sup>2</sup>, determine the percent reduction in area.

# 國立虎尾科技大學 114 學年度第 1 學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

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科目：機械製造

## NOTE :

(1) 本試題共有 6 題，任選 5 題作答，每題 20 分，合計 100 分。

This test consists of 6 questions. Answer any 5. Each question is worth 20 points, for a total of 100 points.

(2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。

Please answer in order on the answer sheet and clearly indicate the question numbers. If the selected question numbers are not indicated or if more than the required number of questions are answered, only the earlier answers in the response order will be graded.

(3) 閉書考、可使用計算機

Close book and Engineering calculator is allowable.

1. Explain the principle, advantages and disadvantages of electrical discharge machining?
2. Explain the effects of hot forging, cold forging and warm forging on the shape and material properties of the product?
3. What is the Virtual Manufacturing Technology (VMT)?
4. What is the purpose of case hardening? Explain the processing steps of case hardening?
5. Cutting S45C Steel by a milling machine with HSS cutter, 50m/min linear cutting speed and 0.2mm chip thickness (this is a normal setting in cutting process). In the view of destruction mode, the chips are “Continuous Chips” or “Discontinuous Chips”? Why?
6. Why the cutting surface of up milling is worse than down milling?