

Name: _____

Student ID No: _____

Faculty of Engineering Prince of Songkla University

การสอบกลางภาคการศึกษาที่ 1

ปีการศึกษา 2554

วันจันทร์ที่ 1 ส.ค. 2554

เวลา 9:00 – 12:00 น.

วิชา 237-511 Advanced Metal Casting

ห้อง A 401

คำสั่ง

- (1) เขียนคำตอบให้สมบูรณ์ทุกข้อเพื่อให้ได้คะแนนเต็ม
- (2) ให้เอา กระดาษ A4 1 แผ่น เข้าห้องสอบได้
- (3) ให้เอา เครื่องคิดเลข และ Dictionary เข้าห้องสอบได้
- (4) อ่านคำสั่งให้ละเอียด และตอบทุกคำถาม

ทิวจรตในการสอบโทษขัันต่ำคือปรับตกในรายวิชาที่ทิวจรตและพัทการศีกษา 1 ภาคการศีกษา

Question No.	Point	Result
1	20	
2	20	
3	30	
4	30	
	Total	

Name: _____

Student ID No: _____

1. Melting Processes (20 points).

1.1 Explain clearly how these furnaces work. Also use drawings.

i. Gas stack furnace (5 points)

ii. Induction furnace (5 points)

1.2 How much does it cost to melt and hold 100 Ton of pure aluminum (superheat = 100C) using a gas reverb furnace? (10 points)

Given the following data:

Gas price = 20 Baht/kg

Heat Content of Gas = 50 MJ/kg

$$q = C_{p,s} (T_l - T_i) + \Delta H_f + C_{p,l} \Delta T_s$$

โลหะผสม	$C_{p,s}$ (J/kg°C)	$C_{p,l}$ (J/kg°C)	ΔH_f (J/kg°C)
Al	1,190	1,090	398,000

Melting Furnace Efficiencies	Melt Loss (%)	Thermal Efficiency (%)
Aluminum; Gas Reverb	3 – 5	30 – 35
Aluminum; Gas Stack Melter	1 – 2	40 – 45
Aluminum; Electric Reverb	1 – 2	59 – 76
Aluminum; Induction	0.75 – 1.25	59 – 76
Aluminum; Gas Crucible	3 – 4	7 – 19

Name: _____

Student ID No: _____

2. Casting Processes (20 points).

2.1 Choose the right casting processes and explain clearly how to produce the following parts:

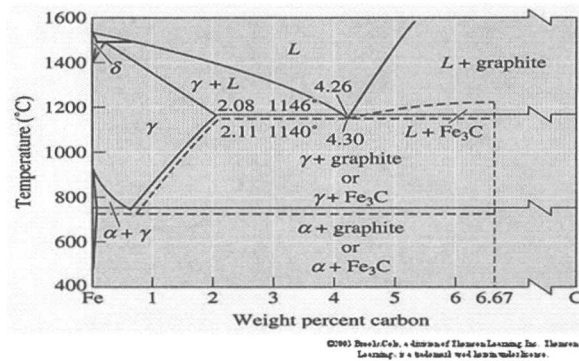
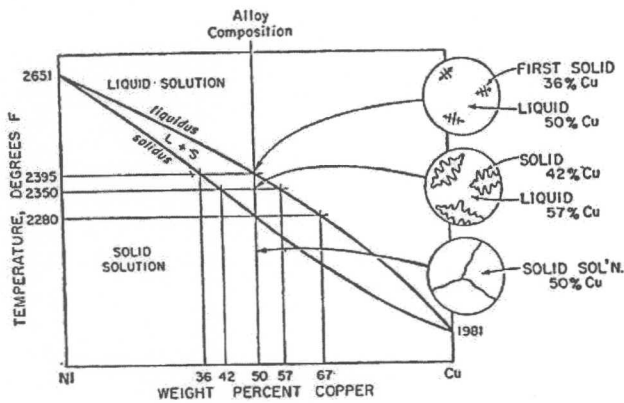
i. Aluminum alloy wheels with the order of 1,000,000 pieces/year (5 points).

ii. Zinc zip parts with the order of 1,000,000 parts/year (5 points).

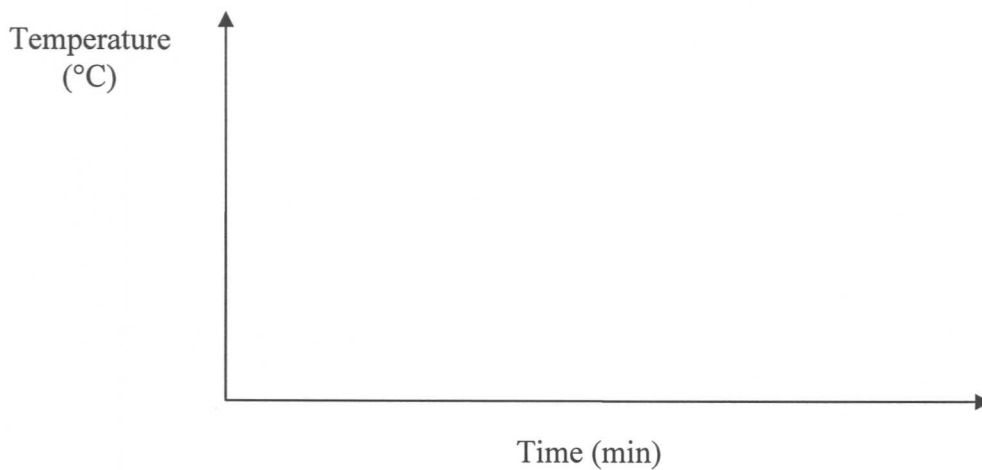
2.2 Give two limitations of hot chamber die casting. (5 points)

2.3 Explain the plaster mold casting process. (5 points)

3. Cast Metals (30 points)



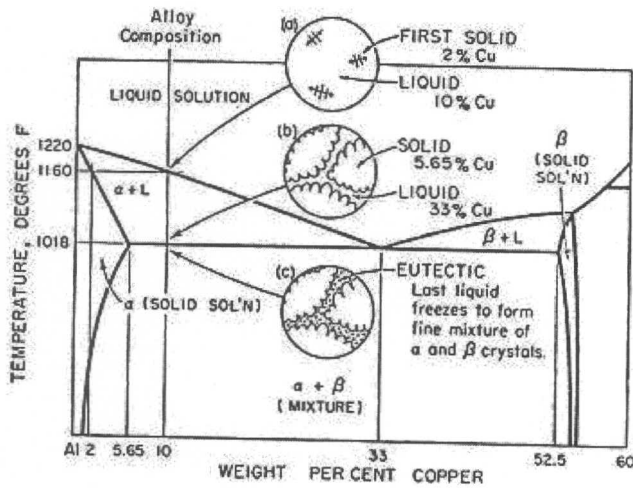
a) Draw a cooling curve of Ni-57%Cu solidifying slowly in a sand mold. Include as much detail as possible such as the melting point. (Note: There is a 5°C undercooling) (5 points).



b) Draw a cooling curve of Fe-2.5%C cast iron solidifying slowly in a sand mold. Include as much detail as possible such as the liquidus, solidus, or eutectic temperatures. (Note: There is a 5°C undercooling) (5 points).



c) How much copper (wt%) is in the middle of the dendrite and outside dendrite for a Al-15%Cu. (5 points)



d) Explain clearly how a peritectic microstructure is formed? (5 points)

Name: _____

Student ID No: _____

e) For gray cast iron, what type of graphite flake do we want to have? (5 points)

f) Explain clearly how to produce ductile cast iron? (5 points)

4. Solidification (30 points)

a. Explain clearly the effects of pressure on undercooling (10 points).

Name: _____

Student ID No: _____

b. Explain clearly the effects of undercooling on nucleation (10 points).

c. Explain clearly why constitutional undercooling is needed for dendritic growth (10 points).

♥ GOOD LUCK ♥