



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017**

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COURSE NAME : APPLIED METALLURGY
COURSE CODE : BDB40503
PROGRAMME : 4 BDD
EXAMINATION DATE : DECEMBER 2016 / JANUARY 2017
DURATION : 3 HOURS
INSTRUCTION : ANSWER **FIVE (5)** FROM SIX (6)
QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

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- Q1**
- (a) Identify THREE (3) methods to transfer molten metal. (3 marks)
- (b) Sketch the schematic of the mechanism of surface film damage from turbulence. (3 marks)
- (c) Compare the low pressure die casting and high pressure die casting. (6 marks)
- (d) Hairi wants to cast a material which have melting temperature higher than 1000°C . He also needs to avoid reactivity between the melts and mould. Select the suitable mould that can be used and give your justification. (8 marks)
- Q2**
- (a) Explain THREE (3) measurements of sand quality. (3 marks)
- (b) Sketch THREE (3) types of defects that normally found in die-casting product. (3 marks)
- (c) Distinguish between squeeze die casting and semi solid die casting in terms of property of product produce, starting materials form and cast metals. (6 marks)
- (d) Karim wants to cast the aluminium with different range of size. The dimensional accuracy is not a problem as he has the machining expertise. The cheapest technique will be an advantage. Select the suitable casting method with justification. (8 marks)
- Q3**
- (a) Explain THREE (3) factors that determining fluidity. (3 marks)
- (b) Calculate the free energy for heterogeneous nucleation if the nucleation happen at wetting angle, $\theta = 20$ degree. (Given interfacial energy = $95 \times 10^{-3} \text{ J/m}^2$ and volume free energy = 470 J) (3 marks)

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- (c) A metal need to flow into a mould with 15 cm long and 2 cm thick. Given are the metal velocity and thermal diffusivity which are 12 cm/s and 0.6 cm²/s respectively. Evaluate either the short shot defects will happen during casting. Give your justification.

(6 marks)

- (d) Figure Q3 (d) shows the binary phase phase diagram. At weight percent X, construct the possible solidification cooling curve with explanation.

(8 marks)

- Q4** (a) Describe THREE (3) importances of powder metallurgy.

(3 marks)

- (b) Illustrate the powder elements in common powder metallurgy terminology.

(3 marks)

- (c) Compare the density of compacted sample that using single moving punch and two moving punch.

(6 marks)

- (d) Secondary operations are performed to increase density, improve accuracy, or accomplish additional shaping of the sintered part. Suggest FOUR (4) possible secondary operation that could be conducted to improve the powder metallurgy product.

(8 marks)

- Q5** (a) Identify the principal methods in producing metallic powder commercially.

(3 marks)

- (b) Sketch the tensile features, elongation and impact strength relatives to percentage of porosity.

(3 marks)

- (c) Relate the tensile properties to the density.

(6 marks)

- (d) Propose the consideration that important to produce high density, high strength and low porosity of powder metallurgy parts.

(8marks)

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- Q6** (a) Describe the characteristic of powder metallurgy application. (3 marks)
- (b) Illustrate THREE (3) region of the fatigue fracture surface. (3 marks)
- (c) Compare the stress strain curve for different level of density of Fe-Mo pre alloy product. (6 marks)
- (d) Laily wants to design a powder metallurgy product. Several consideration shall be taken into account. As an engineer, suggest the design guideline to Laily. (8 marks)

-END OF QUESTION-

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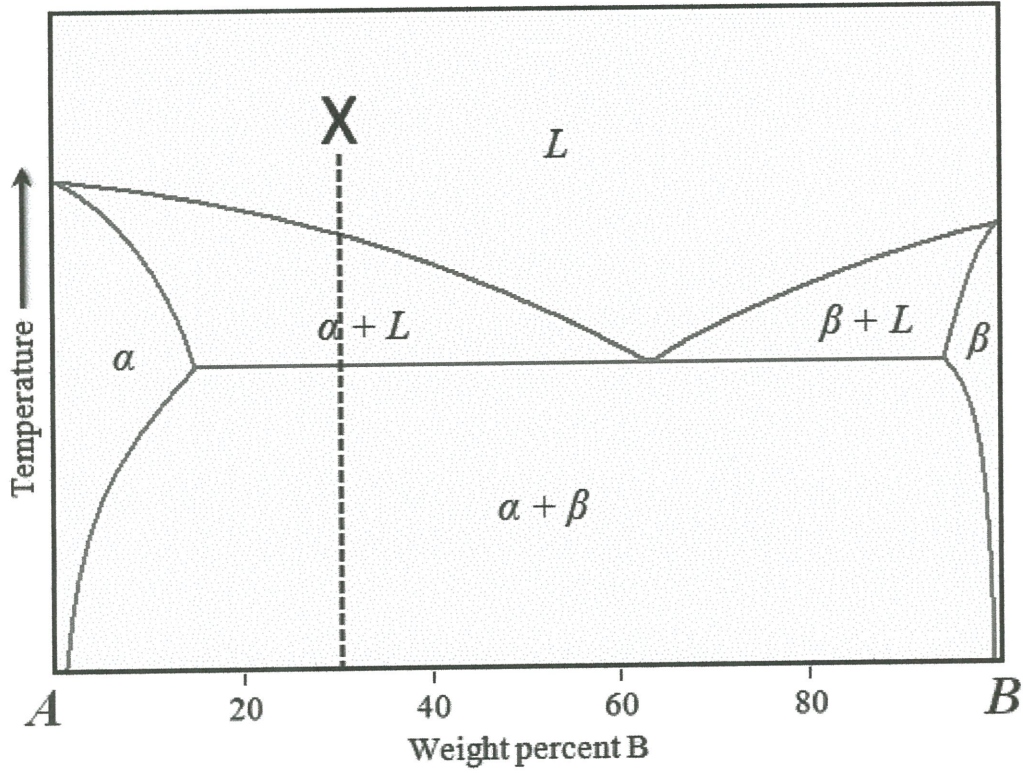


FIGURE Q3 (d)

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