



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023**

- COURSE NAME : APPLIED METALLURGY
COURSE CODE : BDB 40503
PROGRAMME CODE : BDD
EXAMINATION DATE : JULY / AUGUST 2023
DURATION : 3 HOURS
INSTRUCTION : 1. ANSWER **5 (FIVE)** QUESTIONS **ONLY**.
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**.
3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

- Q1**
- (a) Loss form casting methods is a casting process that used polystyrene as the pattern. Due to low melting temperature of this pattern, there is no need to remove the pattern during pouring of molten metal. Sketch this casting process.
(4 marks)
- (b) Company ABC is producing a casting product by using a core. Analyse the precautions steps that need to be taken to produce good quality casting.
(6 marks)
- (c) Evaluate the methods of producing good casting product which related to liquid front.
(10 marks)
- Q2**
- (a) Determine the quality of sand in terms of permeability and collapsibility.
(4 marks)
- (b) Analyse the quality of casting products based on their chemical composition.
(6 marks)
- (c) A customer request for metal matrix composite using fibre reinforcement. The aluminium that will be used has low fluidity. Suggest a suitable casting method that fulfilled the requirement. Support your suggestion with explanations and illustrations.
(10 marks)
- Q3**
- (a) Illustrate and explain the energy that involve in homogeneous nucleation.
(4 marks)
- (b) Distinguish between the columnar and equiaxed crystal of ingots with a suitable sketch.
(6 marks)
- (c) Evaluate the metallic projection defect that results in cracked or broken mould.
(10 marks)

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- Q4** (a) Illustrate TWO (2) types of incomplete casting defects. (4 marks)
- (b) Powder metallurgy is a fabrication technique that involves three major processing stages: (i) production of metal powder, (ii) compaction and shaping of the powder, and (iii) consolidation and fusing of the powder into a solid metal component under high temperature and pressure. Analyse the limitation of powder metallurgy methods. (6 marks)
- (c) Evaluate the relationship between the conductivity, elongation, and tensile strength of a powder-metallurgy product and its sintered density. (10 marks)
- Q5** (a) Determine the variables that contribute to the properties of the powder metallurgy product. (4 marks)
- (b) Analyse the effect of compacting pressure and sintering temperature to the hardness property of the powder metallurgy product. (6 marks)
- (c) Porosity could not be avoided in powder metallurgy. Suggest suitable methods or processes to reduce the porosity in powder metallurgy product. (10 marks)
- Q6** (a) Demonstrate the changes of stress-strain graph due to the changes of density. (4 marks)
- (b) Examine the element that determine the chosen load for Brinell hardness test. (6 marks)
- (c) Customer has requested a product to be produced by powder metallurgy. The product will be used at elevated temperature for long period of time. Suggest suitable testing that the product should go through to fulfil the requirement with its characteristic. (10 marks)

~ END OF QUESTIONS ~