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Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2018/2019**

COURSE NAME : METAL CASTING PROCESS  
COURSE CODE : BDD 40603  
PROGRAMME CODE : BDD  
EXAMINATION DATE : JUNE/JULY 2019  
DURATION : 3 HOURS  
INSTRUCTION : ANSWERS FIVE (5) QUESTIONS  
ONLY

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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- Q1** (a) Differentiate the different of open mould and close mould with illustrate figure. (6 marks)
- (b) Compare the advantages of sand cast compare with die casting. (4 marks)
- (c) Preparation of moulding sand is a key process, determining the final quality of casting products. Special requirements are imposed at stabilising and optimising the parameters of the moulding sand so that it should maintain its properties required for moulding. Justify FIVE (5) measurement in sand quality to prepare and control the high quality casting. (10 marks)
- Q2** (a) Describe your observation of nucleation and growth stage during solidification of cast structure. (6 marks)
- (b) Analyse the temperature and alloy composition that you observed for solidification of Ni-Cu alloys with illustrated figure. (6 marks)
- (c) After molten metal is poured into a mould, cooling rate plays important aspect for determine the final casting product during solidification process. Propose the correlation between cooling rate and final properties of a casting? (8 marks)
- Q3** (a) Demonstrate the operation of sand casting process with illustrate figure. (8 marks)
- (b) Compare THREE (3) types of moulds for sand casting. (6 marks)
- (c) The forming of holes, internal cavities and other internal surface of casting depends on cores. Therefore core can be defined as that portion of mould which form the hallow interior of casting or hole through the casting. Mostly sodium silicate materials and several requirement of core are needed to fulfill the sand cast quality. Justify SIX (6) requirements of core in the sand cast to produce a high quality cast product. (6 marks)

- Q4** (a) Describe the fluidity and its measurement method? (5 marks)
- (b) Sketch a casting defect called misrun and explain the possible causes for them to form? (5 marks)
- (c) Evaluate the defect which can form in sand castings if the pouring temperature is too high and fluidity is too great? (5 marks)
- (d) Justify the significance to design the geometry of the gating system to control the rate of metal flow as it travels from the pouring cup into the mould cavity? (5 marks)

**Q5** During pouring into a sand mould, the molten metal can be poured into the downsprue at a constant flow rate during the time it takes to fill the mould. At the end of pouring the sprue is filled and there is negligible metal in the pouring cup. The downsprue is 6.0 in long. Its cross sectional area at the top =  $0.8 \text{ in}^2$  and at the base =  $0.6 \text{ in}^2$ . The cross sectional area of the runner leading from the sprue also =  $0.6 \text{ in}^2$ , and it is 8.0 in long before leading into the mould cavity, whose volume =  $65 \text{ in}^3$ . The volume of the riser located along the runner near the mould cavity =  $25 \text{ in}^3$ . It takes a total of 3.0 sec to fill the entire mould (including cavity, riser, runner, and sprue). This is more than the theoretical time required, indicating a loss of velocity due to friction in the sprue and runner. Evaluate the following items:

- (a) The theoretical velocity and flow rate at the base of the downsprue. (5 marks)
- (b) The total volume of the mould. (5 marks)
- (c) The actual velocity and flow rate at the base of the sprue. (5 marks)
- (d) The loss of head in the gating system due to friction. (5 marks)

- Q6**
- (a) Justify the significant to provide allowances in the production of pattern. (4 marks)
  
  - (b) Analyzed the features that could affect the life of a permanent mould. (6 marks)
  
  - (c) Justify how sand affects the quality aspects of the casting. (5 marks)
  
  - (d) Formulate some of the possible approaches that can be taken to prevent the formation of gas porosity in a metal casting. (5 Marks)

– END OF QUESTIONS –