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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2013/2014**

COURSE NAME : RAPID PRODUCT DEVELOPMENT
AND MANUFACTURING
COURSE CODE : BDD4033 / BDD40303
PROGRAMME : 4 BDD
EXAMINATION DATE : JUNE 2014
DURATION : 2 ½ HOURS
INSTRUCTION : **ANSWER ALL FOUR (4) QUESTIONS
IN SECTION A AND ONE(1)
QUESTION FROM TWO(2)
QUESTIONS PROVIDED IN
SECTION B**

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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SECTION A

- Q1** (a) Many terms have been used to describe the meaning of Rapid Prototyping (RP). Discuss THREE(3) of such terms and explain why they have been used in place of RP. (6 marks)
- (b) Describe the advantages of Rapid Prototyping (RP) in terms of its beneficiaries such as the product designers, tool designers and manufacturing engineers. (6 marks)
- (c) Why do some Rapid Prototyping (RP) parts require finishing processes? Discuss THREE(3) methods to enhance surface roughness and accuracy of RP parts. (8 marks)
- Q2** (a) Compare the differences between Multi-Jet Modelling(MJM) and Fused Deposition Modelling(FDM). Explain THREE(3) strengths and weaknesses of these two systems. (10 marks)
- (b) Draw the schematic diagram and describe the process Multi-Jet Modelling(MJM) system. (10 marks)
- Q3** (a) It is known that the process parameters such as layer thickness, part orientation and binder setting saturation value (shell and core) are determined according to certain values in the three-dimensional printing process(3DP). Briefly explain these THREE(3) process parameters. (6 marks)
- (b) Name the THREE(3) types of material processing capabilities of the Selective Laser Sintering(SLS) systems and briefly explain the benefits of each type. (6 marks)
- (c) A three-dimensional printer(3DP) creates parts by a layered printing process and adhesive bonding, based on sliced cross-sectional data. Illustrate with an appropriate schematic diagram the 3DP system operations. List TWO(2) types of application for the 3DP process. (8 marks)

- Q4** (a) Briefly explain, the application of rapid tooling(RT) in investment casting (IC). What are the THREE(3) advantages and disadvantages of rapid tooling in investment casting?
(4 marks)
- (b) How would you differentiate between the following types of rapid tooling Processes. Support your answer with relevant examples.
- (i) Direct soft tooling
 - (ii) Indirect soft tooling
 - (iii) Direct hard tooling
 - (iv) Indirect hard tooling
- (8 marks)
- (c) What are the Rapid Prototyping(RP) systems that is suitable for sand casting? Draw a suitable schematic diagram of RP part in sand casting process.
(8 marks)

SECTION B

- Q5** (a) Rapid Prototyping(RP) model is possible to create a very quick an injection mold for a limited number of parts. By referring to the components shown in Figure **Q5**, select appropriate rapid tooling(RT) method to create injection mould which can produce more than 200 units of the component. Your answer should include the advantages of the method selected.
(5 marks)
- (b) Create a suitable process flow diagram and explain this process to manufacture the product shown in Figure **Q5** made by this injection mould.
(15 marks)
- Q6** (a) Arcylic based materials produced by Multijet Modeling(MJM) method shown in Figure **Q6** is used to produced as master pattern to prepare a soft tooling mould. Select indirect soft tooling method to cast 20 pieces of wax pattern to be used in investment casting(IC) mould fabricaton. Your answer should include the advantages of the method selected.
(5 marks)

- (b) Create a suitable process flow diagram and explain the process to manufacture the product shown in Figure Q6 made by this indirect soft tooling method.

(15 marks)

- END OF QUESTION -

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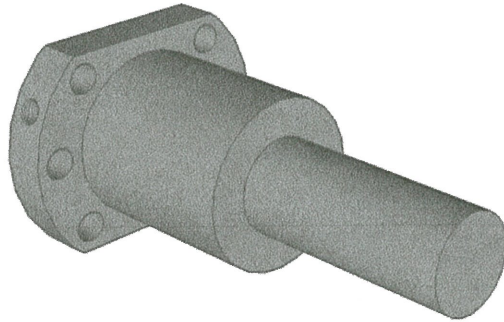


FIGURE Q5

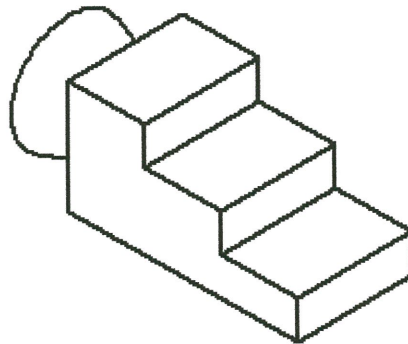


FIGURE Q6