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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2012/2013**

**COURSE NAME : RAPID PRODUCT  
DEVELOPMENT AND  
MANUFACTURING**

**COURSE CODE : BDD 4033 / BDD 40303**

**PROGRAMME : 4 BDD**

**EXAMINATION DATE : JUNE 2013**

**DURATION : 3 HOURS**

**INSTRUCTION : ANSWER ALL QUESTIONS**

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

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- Q1** (a) What are the three phases of prototyping? Contrasting these with those of geometric modeling, what similarities can be drawn?  
(9 marks)
- (b) Rapid Prototyping (RP) is the most general name given to a host of technologies that are used to build physical objects directly from CAD data sources. List **five (5)** reasons of Rapid Prototyping.  
(5 marks)
- (c) RP systems in the market today can be classified broadly by the initial form of its material, i.e., the material that the prototype or part is built with. In this manner, all RP systems can be easily categorized into three types. Describe those three types of RP materials.  
(6 marks)
- Q2** (a) Although there are many RP techniques available, almost all follow the same basic **five (5)** steps process in making a prototype. Describe briefly the 5 steps.  
(5 marks)
- (b) All rapid prototyping processes known today work as 2½D processes, some processes (e.g., extrusion processes) are in principle of 3D processes. Differentiate in brief the meaning of 2½D processes.  
(6 marks)
- (c) Some RP techniques require support structure in the part fabrication. What does it mean by support structure and list **two (2)** rapid prototyping techniques that **does not** require any support and provide with the reason.  
(6 marks)
- (d) Explain what is Reverse Engineering technology with reference to the development of a product.  
(3 marks)
- Q3** (a) Make a simple evaluation or analysis on part fabricated using 3D Printing (3DP) and Fused Deposition Modelling (FDM) process with respect to the properties below:
- (i) Type of materials
  - (ii) Solidification method
  - (iii) Post processing work

(6 marks)

- (b) Draw the schematic diagram and describe the process flow of the Stereolithography Apparatus (SLA) systems?

(6 marks)

- (c) Stereolithography Apparatus (SLA) systems build parts in a vat of photo-curable liquid resin that cures or solidifies under the effect of exposure to UV light. Explain the process of polymerization during solidification.

(4 marks)

- (d) Illustrate with a neat sketch and explain what it means by overcured resin systems?

(4 marks)

- Q4** (a) Explain Fused Deposition Modeling (FDM) with regards to :

- i. Principle of layer Generation
- ii. Materials used and Post Processing
- iii. Speed and Accuracy

(9 marks)

- (b) Selective Laser Sintering (SLS) is an additive manufacturing technique that uses a high power laser. Explain with diagrams the working principle and details of the fabrication process.

(6 marks)

- (c) What is the most dominant surface effect caused by RP processes? Outline how can this effect be minimized?

(5 marks)

- Q5** (a) Explain in detail how a rapid prototyping pattern can be used for vacuum casting with silicon molding. Use appropriate examples to illustrate your answer.

(10 marks)

- (b) What are the typical RP applications in design? Briefly describe one of these applications and illustrate them with examples.

(5 marks)

- (c) What are the typical RP applications in engineering and analysis? Briefly describe one of them and illustrate them with examples.

(5 marks)

END OF QUESTIONS