FINAL
Examination Paper
(COVER PAGE)

Session : May 2008

Programme : Diploma in Mechatronics Engineering

Course : EGM265: Manufacturing Processes & Automation

Date of Examination : August 16, 2008

Time : 11.00 am - 1.00pm    Reading Time : Nil

Duration : 2 hours

Special Instructions : 

This paper consists of SIX (6) questions. Answer any FOUR (4) question in the answer booklet provided. All questions carry equal marks.

Materials permitted : Non-Programmable Calculator

Materials provided : Nil

Examiner(s) : Mr Sami Salama Hussen Hajej

Moderator : Prof. Dr. Shamsuddin Bin Sulaiman

This paper consists of 4 printed pages, including the cover page.
This paper consists of SIX (6) questions. Answer any FOUR (4) questions in the answer booklet provided. All question carry equal marks.

**Question 1**

(a) In machining operations, the process can be controlled and determined based on what is referred to as the *independent variables* and the *dependent variables*. List and discuss FIVE (5) independent variables that control the machining process.

(5 marks)

(b) Tool wear is a major factor in material cutting, explain the following related terms (with sketches if needed):

(i) Tool wear
(ii) Tool wear limit
(iii) Tool life
(iv) The ISO limit
(v) Tool wear rate

(10 marks)

(c) Machining operations are very important in the industry. There are wide variety of machining operations, each with its special features and applications. List and discuss FIVE (5) reasons why machining is very important.

(10 marks)

**Question 2**

(a) Bulk deformation is family of operations that involve plastic deformation, each with its unique applications and needs, briefly explain the working principles of FIVE (5) forging operations

(5 marks)

(b) For the following bulk deformation processes, explain the working principle (using a sketch if needed).

(i) Forging
(ii) Rolling (flat)
(iii) Extrusion
(iv) Drawing
(v) Swaging

(15 marks)
(c) Discuss and explain the advantages and disadvantages of Bulk deformation processes over other operations. (5 marks)

**Question 3**

(a) Explain the difference and the relationship between the design process and Manufacturing process. (5 marks)

(b) Design for X is a very important aspect of product design. Explain the meaning of DFX and explain its importance. (10 marks)

(c) You were handed a design by your manager, and were assigned to select the best suitable material for this design. What factors would you consider in your material selection process? Why? (10 marks)

**Question 4**

(a) Discuss **FIVE (5) disadvantages** of welding operations. (5 marks)

(b) Briefly explain the working principle of the following joining operations (with sketches if needed):

(i) Shielded arc welding
(ii) EBM welding
(iii) Friction welding
(iv) Torch Brazing
(v) Metal stitching (10 marks)

(c) Design for welding (DFW) is an important factor of DFM, list and discuss **FIVE (5) design guidelines** for Design for Welding. (10 marks)
Question 5

(a) One of the early steps in the manufacturing process is process selection whereby the best process is selected to produce the product required. What factors would you consider when you select a process?  
(10 marks)

(b) What is the meaning of *manufacturing properties*? Give an example.  
(10 marks)

(c) Which decision should come first: selecting material or selecting process? Or are they inter-related? Give an example.  
(5 marks)

Question 6

(a) The following terms are very important for casting operations, controlling them will determine the success of the casting operation. Discuss and explain the importance of each of the following terms:

(i) Solidification  
(ii) Heat transfer  
(iii) Cooling rate  
(iv) Fluid flow  
(v) Shrinkage  
(5 marks)

(b) For the following casting processes, explain the working principle (using a sketch if needed).

(i) Sand casting  
(ii) Evaporative-pattern casting  
(iii) Die casting  
(iv) Injection mould casting  
(v) Centrifugal casting  
(10 marks)

(c) One of the crucial aspects of casting process design is determining the location and the size of the Riser. Discuss **FIVE (5)** rules of riser design.  
(10 marks)