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SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2013 SESSION

SUBJECT CODE	:	**FGB 33203**
SUBJECT TITLE	:	**MODERN MACHINING**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**2.5 HOURS**
DATE	:	

INSTRUCTIONS TO CANDIDATES

1. **Please read the instructions given in the question paper CAREFULLY.**
2. **This question paper is printed on both sides of the paper.**
3. **Please write your answers on the answer booklet provided.**
4. **Answers should be written in blue or black ink except for sketching, graphic and illustration.**
5. **This question paper consists of ONE (1) section. Answer FOUR (4) questions only.**
6. **Answer all questions in English.**
7. **Formula sheet is appended**

THERE ARE 4 PAGES OF QUESTIONS AND 1 PAGE APPENDIX, EXCLUDING THIS PAGE.

INSTRUCTIONS: Answer FOUR (4) questions only.

Question 1

(a) Explains the categories of process for Mechanical Machining, Thermal Machining and Chemical / Electrochemical Machining in modern machining processes

(9 marks)

(b) With the aid of a sketch, describe the cutting nozzle of an abrasive water jet system.

(6 marks)

(c) In a water jet cutting system, the orifice used has a diameter of 0.4 mm. Calculate the jet velocity at 5000 bar if no losses are assumed and determine the mass flow rate of water.

(4 marks)

(d) Briefly discuss definition of Modern Machining Process (MMP) and give 3 reasons why MMP are required?

(6 marks)

Question 2

(a) Electrochemical Machining (ECM) uses reverse electrolysis to remove material from work piece.

(i) Explain in detail on the process of ECM in term of system and material removal rate with the assistance of diagrams.

(15 marks)

(ii) Does tool wear occur in ECM, explain why?

(5 marks)

(iii) Explain the meaning of equilibrium gap in ECM.

(5 marks)

Question 3

(a) Describe with the aid of sketches, the concept and process of machining work piece using ultrasonic machining (USM).

(10 marks)

(b) Explain type of materials can be machined by ultrasonic machine machining (USM) and give the examples of that material.

(5 marks)

(c) Explain the main components of ultrasonic machine machining (USM).

(5 marks)

(d) Briefly discuss the abrasive material selection in U.S.M. process and give examples the types of abrasive that usually used.

(5 marks)

Question 4

(a) Describe the process of electron beam machining with the aid of sketches.

(8 marks)

(b) Explain the advantages and disadvantages of laser beam machining

(8 marks)

(c) Explain the concept of undercut in term of its relation with etching depth in chemical milling. Provide sketches if necessary.

(6 marks)

(d) Briefly explain the difference between chemical machining and photochemical machining.

(3 marks)

Question 5

(a) The Lazarenko's generator In Electric Discharge Machining (EDM) for Die Sinking operation has the following characteristic: V_o = 240 V, R = 10 Ω and C = 3 μF in order to performing at maximum removal rate (MRR), calculate:

1) Calculate the discharge voltage and the charging time (t_c).
2) The cycle frequency (f_r) and the energy/individual discharge of the capacitor (E_d)
3) The estimate of the expected gap to realize the cut if the dielectric strength is 180V/25 μm

(13 marks)

(b) Electric Discharge Machining (EDM) wire cutting is a continuously moving wire travels along a prescribed path of the work-piece by discharge sparks acting like cutting teeth. According to drawing given in figure 1, write down the coordinate system in order to perform the cutting process in EDM wire cut by assumed 0.20 of wire diameter and 40 micron spark gap.

(12 Marks)

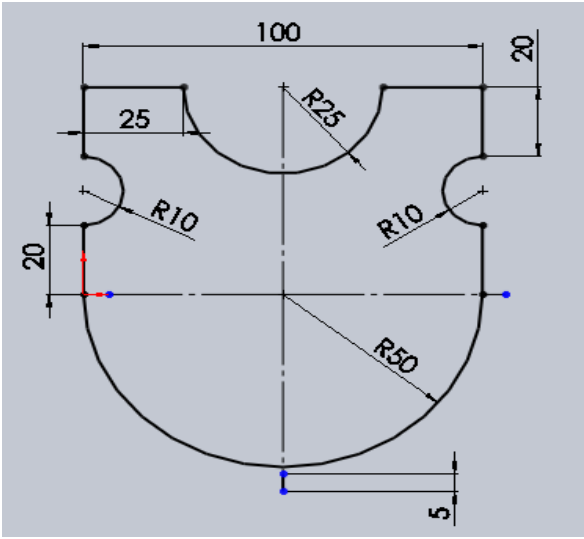

Figure: 1

END OF QUESTION

APPENDIX

List of formula

$$v_w = \sqrt{\frac{2p}{\rho_w}}$$

$$m_w = \rho_w . Q_w = \rho_w \frac{\pi}{4} d_o^2 v_w$$

$$\rho_{alloy} = \frac{1}{\sum \frac{\alpha_i}{\rho_i}}$$

$$MRR = \frac{1}{F\rho \sum \frac{\alpha_i v_i}{A_i}}$$

$V_s = 0.73V_o$

$V_s = V_o(1 - e^{-t_c/RC})$

$f_r = 1 / (t_c + t_d)$

$E_d = ½ cV_s^2$

$$\frac{MRR_1}{MRR_2} = \frac{value_1}{value_2}$$