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SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JANUARY 2014 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) Modern Machining Processes (MMP) or Non Traditional Processes can be divided into THREE (3) categories. Demonstrate these categories using flow chart by giving examples of each process.

(6 marks)

(b) With the aid of a diagram in figure 1, explain the process of Water Jet Machining system at each station (A, B & C).

(9 marks)

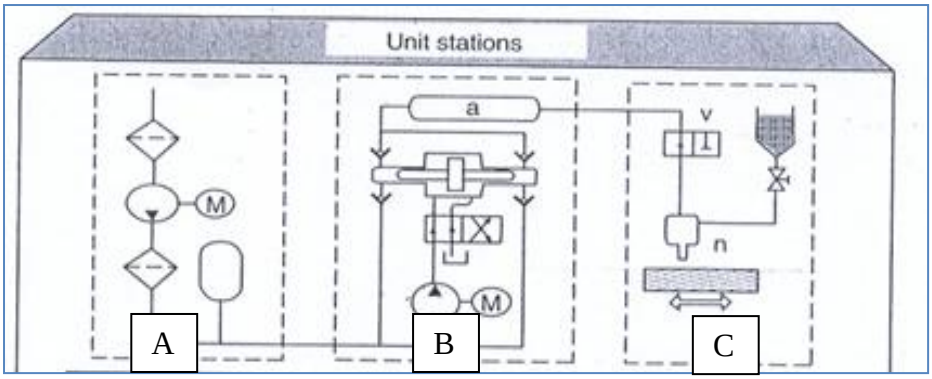

Figure 1

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

(6 marks)

(d) In a water jet cutting system, the orifice used has a diameter of 0.3 mm. What is the jet velocity at 4000 bar if no losses are assume and calculate the mass flow rate of water.

(4 marks)

Question 2

(a) Briefly explain 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 3

(a) 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 perform at maximum removal rate (MRR). By apply the formula given in appendix attached, calculate:

(i) The discharge voltage and the charging time (t_c).

(ii) The cycle frequency (f_r) and the energy/individual discharge of the capacitor (E_d)

(iii) The estimate of the expected gap to realize the cut if the dielectric strength is 180V/25 µm

(13 marks)

(b) 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 2, construct the coordinate system in order to perform the cutting process in EDM wire cut by assumed 0.25 of wire diameter and 50 micron spark gap.

(12 marks)

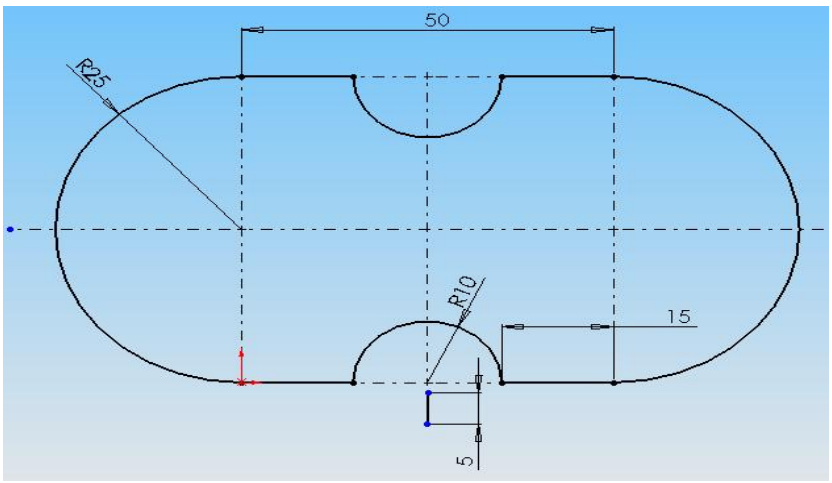

Figure 2

Question 4

(a) Explain and demonstrate 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 example types of abrasive that commonly used.

(5 marks)

Question 5

(a) Explain the elements that affect the capability of Abrasive jet machining.

(8 marks)

(b) Explain the functions of the dielectric fluid in Electro Discharge Machining? Give THREE (3) examples of dielectric fluid.

(5 marks)

(c) Explain why nozzles for the Water Jet Machining system are made from very hard materials and Give TWO (2) examples of the material use to make the nozzles.

(6 marks)

(d) Briefly summarise the principle operations of EDM Wire Cutting machining. You may use sketches or diagrams.

(6 marks)

END OF QUESTION

APPENDIX

List of formula

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

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

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

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

$V_s = 0.73V_o$

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

$f_r = 1 / (t_c + t_d)$

$E_d = ½ cV_s^2$

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