Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	MODERN MACHINING TECHNOLOGY
COURSE CODE	:	BNM 30103
PROGRAMME CODE	:	BNM
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) Explain the importance of High Speed Machining (HSM) compare to Electrical Discharge Machining (EDM).

(4 marks)

(b) Etchant solution is essential in order to obtain better machining performance. However, the performance of etching process depends on the work material, material removal rate and surface finish. Evaluate these factors by giving a supporting statement in order to defend it.

(6 marks)

(c) Chemical milling is used to produce an aircraft component made of an aluminium alloy. The dimension of this component is 250 mm x 300 mm and the initial thickness is 15 mm. A circular shape pocket with diameter of 35 mm and depth of 10 mm is to be etched using NaOH. The penetration rate is 0.03 mm/min and etch factor is 1.5. Analyze the material removal rate (mm^3/min), time required to etch the specific depth (min) and undercut (mm).

(10 marks)

Q2 (a) Explain the importance of spark gap in Electrical Discharge Machining (EDM) process.

(4 marks)

(b) Differentiate between Nd:YAG laser and CO_2 laser in terms of their construction.

(6 marks)

(c) List **FOUR (4)** types of laser output available in the market. Point out which is the best type of laser output.

(10 marks)

Q3 (a) Assisted by a sketch, explain the principles of Electron Beam Machining (EBM) and identify at least **FOUR (4)** process parameter that determine the machining characteristics.

(10 marks)

(b) Dual gas plasma torch and water injected plasma are the two common plasma arc cutting system available in the market. Compare the systems in terms of the working principle, main gases, shielded gases and recommended workpiece.

(10 marks)

Q4 (a) As an Engineering Technologist, you need to monitor the performance of USM process to ensure it is running at 100% efficiency. However, one day you noticed that the efficiency of the process in terms of material removal rate (MRR) is drastically decreased to 85%. Identify **TWO (2)** of the possible reason, subsequently suggest the factors that affect MRR.

(8 marks)

(b) You are required to fabricate a component as shown in **Figure Q4(b)** by using Ultrasonic Machining (USM) process. Draw the ultrasonic machine construction that can be used to produce the component. Your answer should consist a diagram, the function of each main machine element and evaluate the disadvantages of using this machine.

(12 marks)

Q5 (a) A company producing carbon-fiber reinforced plastic is planning to apply Water Jet Machining as one of the cutting process. Explain with a sketch of the process of generating the high pressure of water jet.

(5 marks)

(b) Explain the advantages of replacing the laser with water jet in machining metallic material.

(5 marks)

(c) Material removal rate used to be one of the important machining characteristic in Abrasive Jet Machining (AJM).

(i) Determine **TWO (2)** more machining characteristic in AJM and

(ii) Estimate the material removal rate in AJM of a brittle material with flow strength of 4 GPa. The abrasive flow rate is 2 g/min, velocity is 200 m/s and density of the abrasive is 2 g/cm^3.

(10 marks)

-END OF QUESTIONS –

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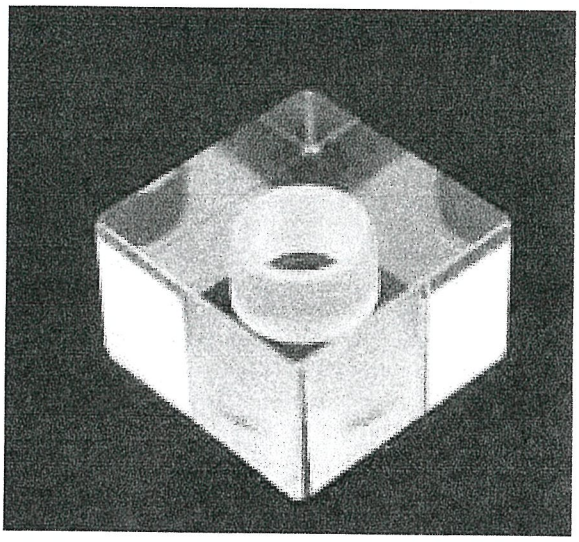

Figure Q4(b)