



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
(ONLINE)  
SEMESTER I  
SESSION 2020/2021**

COURSE NAME : ADVANCED MACHINING PROCESS  
COURSE CODE : MDP 10203  
PROGRAMME : MDM  
EXAMINATION DATE : JANUARY/FEBRUARY 2021  
DURATION : 4 HOURS  
INSTRUCTION : ANSWER FIVE (5) QUESTIONS ONLY  
OPEN BOOK EXAMINATION

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

- Q1** (a) Advanced manufacturing is the use of innovative technologies to improve products or production processes. It is gradually maturing, integrating innovative technology into products and manufacturing processes to enhance competitiveness and increase value. Discover the scientific and technical developments apply to a wide range of advanced manufacturing industries. (10 marks)
- (b) Prepare the key advanced cutting-edge technologies, relevant across multiple industries that show the most potential for advanced manufacturing. (10 marks)
- Q2** (a) With the continuous development of high-speed milling technology, in some non-precision machining fields, part of the demand for electrical discharge machining (EDM) is taken away. High-speed milling and EDM technologies have their own characteristics, and the two can be better integrated. Propose how high-speed machining (HSM) can be integrated with EDM in mold fabrication. (4 marks)
- (b) The wire used in EDM machines, the trend to reduce the diameter of the wire used has caused many problems with handling electrodes and parts. Initially, existing wire machines were adapted to take smaller diameter wires (down to 0.03 mm), but this demanded significant time for machine preparation. The distance from the spool position to the threading nozzle was long, and caused a great deal of inconvenience for the installation of the wire. The dynamic forces on the brakes could not be taken easily by the very thin wire. This resulted in frequent wire breaks, which required manual intervention.
- (i) Recommend problem solving for this issue. (2 marks)
- (ii) Based on **Q2(b)(i)**, predict **THREE (3)** needs and reason of this process during manufacturing (6 marks)
- (iii) Based on **Q2(b)(i)**, describe **FOUR (4)** advantages of the process (8 marks)
- Q3** Cutting with a water jet is a method of engineering for cutting objects using the energy from high speed, high density, and ultra-high pressure water. For this purpose, either specially treated water or an abrasive agent is used.
- (a) Predict **FOUR (4)** features of this machining process (8 marks)
- (b) Compare **FOUR (4)** differences between water jet machining and abrasive water jet machining. (8 marks)

- (c) Analyze the stand of distance consequence on cutting performance especially on material removal rate.

(4 marks)

**Q4** At room temperature a gas usually consists of molecules, most of which are composed of two or more atoms. When the temperature of the gas is raised to about 2000°C, these molecules become dissociated into separate atoms. On further increase in temperature (~3000°C), some of the atoms have their electrons displaced from them and become ionized. Hence, it was electrically charged which consists of positive and negative ions through cathode and anode.

- (a) Predict the name of advanced machining process stated.

(2 marks)

- (b) Based on **Q4(a)**, distinguish **TWO (2)** principle types involved in terms of their components and circuit diagram.

(10 marks)

- (c) Based on **Q4(a)**, different gasses may have to be employed in order to achieve cuts of acceptable quality. Attempts to overcome this problem have led to the consideration of alternative systems. Prepare **TWO (2)** systems in terms of the working principle, main gases involved and recommended workpiece.

(8 marks)

**Q5** (a) Electron beam machining uses a focused beam of high-velocity electrons to remove material. The source of energy in electron beam machining is high velocity electrons. Most of this process are performed in a high vacuum chamber. Evaluate the importance of vacuum in electron beam machining

(4 marks)

- (b) Illustrate the melting stage during electron beam machining process

(8 marks)

- (c) Electron beam machining (EBM), laser beam machining (LBM) and ion beam machining (IBM) used thermal energy to melt and vaporize a tiny volume of material from the work piece. Although mechanism of material removal is same, but the source of heat is different.

- (i) Distinguish between electron beam machining (EBM) and laser beam machining (LBM).

(4 marks)

- (ii) Compare between electron beam machining (EBM) and ion beam machining (IBM).

(4 marks)

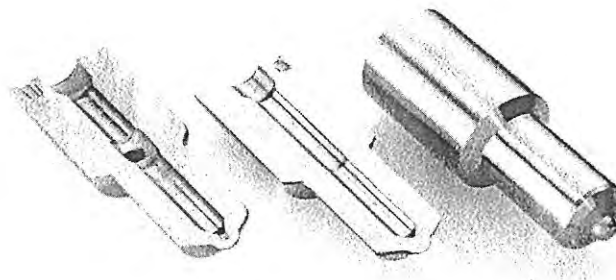
- Q6** (a) **Figure Q6** shows an injection nozzle. As a process engineer, you need to create a heart-shaped gallery in the main bore of the injection nozzles with a suitable process to produce it. In this case, you identified that its works on the principle of anodic metal dissolution by electrical energy where the nozzle will be burr-free with excellent surface finish and distortion less.
- (i) State the name of machining process (1 marks)
  - (ii) Based on **Q6(a)(i)**, propose the working principle to produce the nozzle. (10 marks)
  - (iii) Based on **Q6(a)(ii)**, illustrate the machine setup (3 marks)
- (b) In chemical milling, there have some procedure to undercut underneath the masking tape. Draw the sequence of procedure. (6 marks)

- END OF QUESTIONS -

**FINAL EXAMINATION**

SEMESTER / SESSION : SEM I/ 2020-2021  
COURSE: ADVANCED MACHINING PROCESS

PROGRAM: MDM  
COURSE CODE: MDP 10203



**Figure Q6: Injection nozzle**