

2023

B.E. (Mechanical Engineering)

Sixth Semester

MEC-606: Non-Conventional Manufacturing

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 (Part-A) which is compulsory and selecting two questions each from Part B-C. Calculator is allowed.

x-x-x

Part - A

1. a) Write name of thermoelectric advanced machining processes. 2
- b) Suggest advanced machining and also write parameters to drill in MS plate. 2
- c) What do you mean by Magnetostriction effect? 2
- d) Why ultrasonic assisted EDM is preferred? 2
- e) How ECG is different from ECM? 2

Part - B

2. a) Diameter of AJM nozzle is 1.0 mm and jet velocity is 200 m/s. Find the volumetric flow rate (cm^3/s) of the carrier gas and abrasive mixture. 5
- b) What are process parameters of USM? Explain effect of amplitude on MRR and surface finish. 5
3. a) Explain working principle of chemical blanking process with neat sketch. Write process parameters of chemical blanking. 5
- b) EDM is used to machine a metallic sheet. Calculate surface finish value if $C=15\mu\text{F}$, $V_b=130\text{ V}$, $K_6=4.0$. Use the centre line average (CLA) equation. 5
4. a) Find out energy and power density needed for laser drilling of a hole of dia. 1.3 mm in an iron plate, 1 mm thick, given: density of iron, 8 gm/cm^3 , specific heat of iron, 0.11 cal/g.K , melting point of iron, 1800 K , boiling point of iron, 3000K , ambient temperature, 20°C , latent heat of fusion, 67 cal/g , latent heat of vaporization, 1640 cal/g and efficiency of laser machining, 80% . 5
- b) Electrochemical machining of iron with a copper electrode working in NaCl solution in water, calculate the maximum removal rate if current density is allowed 150 amp/cm^2 , density of iron 7.86 gm/cm^3 . 5

Part - C

5. Find out the approximate time required to machine a hole of diameter equal to 6.0 mm in a tungsten carbide plate (Flow strength of work material = $6.9 \times 10^9\text{ N/m}^2$) of thickness equal to one and half times of hole diameter. The mean abrasive grain size is 0.015 mm diameter. The feed force is equal to 3.5 N. The amplitude of tool oscillations is 25 microns and the frequency is equal to 25 kHz. The tool material is copper having flow strength = $1.5 \times 10^9\text{ N/m}^2$. The slurry contains one part of abrasives to one part of water. Take the values of different constant as $K_1 = 0.3$, $K_2 = 1.8 \times 10^{-6}$ (In SI units) and $K_3 = 0.6$ and abrasive slurry density = 3.8 g/cm^3 . Also calculate the ratio of the volume removed by throwing mechanism to the volume removed by hammering mechanism. 10
6. a) Explain material removal mechanism in plasma arc machining and write its temperature range. How temperature is affecting HAZ? 5
- b) How temperature can vary with electron beam intensity in EBM? Write its limitation. 5
7. What is RC pulse generator? Explain its working with neat sketch. 10

x-x-x