Exam.Code:0942
Sub. Code: 33879

2056
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 which is compulsory and selecting two questions from each Part. All questions carry 10 marks.

x-x-x

Q1.

a. Define non-conventional machining and explain why conventional machining becomes inadequate for high-strength alloys and ceramics.
b. State the principle of ultrasonic machining and mention two important process parameters.
c. Differentiate abrasive jet machining and water jet machining with respect to medium, mechanism and typical applications.
d. Explain the term overcut in electrochemical machining and its significance in accuracy control.
e. List the major process variables in EDM and state their effect on material removal rate.

Part A

Q2.

(a) Discuss the need and industrial importance of advanced manufacturing techniques for machining difficult-to-cut materials.
(b) Develop a selection framework for choosing between USM, AJM, EDM, ECM and LBM for a given material-property and accuracy requirement.

Q3.

(a) Explain the constructional features and complete machining mechanism of ultrasonic machining.
(b) Discuss the influence of abrasive grain size, slurry concentration, tool material, static load and amplitude of vibration on MRR and surface finish for USM.

Q4.

(a) Explain the material removal mechanism in abrasive jet machining and discuss the role of carrier gas pressure, nozzle stand-off distance and abrasive flow rate.
(b) Discuss nozzle wear, taper formation and surface integrity problems in AJM/WJM and suggest methods for process control.

Part B

Q5.

(a) Explain the working principle, process characteristics and procedural steps of chemical machining, including masking, etching and demasking.
(b) Discuss the electrochemical machining setup with neat labels and explain the function of electrolyte, tool cathode, workpiece anode and power supply.

Q6.

(a) Explain the mechanism of material removal in electric discharge machining and discuss the role of spark gap, dielectric fluid, pulse-on time and pulse-off time.
(b) Compare EDM, EBM, IBM, PAM and LBM in terms of energy source, vacuum requirement, thermal damage, heat-affected zone and machining accuracy.

Q7.

(a) In an ECM process, a current of 850 A is used to machine pure iron. Atomic weight of iron is 55.85, valency is 2 and Faraday constant is 96500 C/mol. Density of iron is 7.86 g/cm3. If current efficiency is 92 percent, calculate the volumetric material removal rate in mm3/min.
(b) Explain how electrolyte concentration, inter-electrode gap, current density and tool feed rate affect dimensional accuracy and surface finish in ECM.

x-x-x