

B. PRODUCTION ENGG. EXAMINATION, 2017

(3rd Year, 2nd Semester)

NON-TRADITIONAL MACHINING

Full Marks:100

Time: Three Hours

Part-I

(50 Marks)

Use Separate Answer scripts for each part.

Answer Question 1 and any TWO Questions from the rest.

1.
 - a) Classify mechanical type advanced machining processes.
 - b) Distinguish between AJM and AWJM.
 - c) How is Laser beam different for ordinary torch light?
 - d) What are the types and the function of a horn used in USM?
 - e) Distinguish between rotary USM and stationary USM.
 - f) What is Hybrid Machining? Give two examples.
 - g) Why is vacuum needed in EBM?
 - h) Differentiate between Transferred Arc and Non-Transferred Arc Plasma Cutting system.
 - i) Why is Laser beam used in micro-machining?
 - j) What are the functions of a catcher used in WJM?

(10 x 2)
2.
 - a) Discuss on various elements of Abrasive Water Jet Machining (AWJM) System.
 - b) What are the effects of process parameters on depth of cut in AWJM?
 - c) What are the applications and limitations of AJM?

(5+6+4)
3.
 - a) Discuss on material removal mechanism in Ultrasonic Machining (USM) Process.
 - b) Discuss on different types of abrasives used in USM.
 - c) What are the various process parameters and machining criteria in USM?
 - d) What are the applications and limitations of USM?

(4+3+4+4)
4.
 - a) Discuss on the Nd:YAG or CO₂ Laser beam machining system with sketch.
 - b) What are the advantages of Laser Beam Machining (LBM)?
 - c) Briefly describe the generation principle of Excimer Laser?

(6+4+5)
5.
 - a) Discuss on working principle of Electron Beam Machining (EBM) System with sketch.
 - b) What are the applications of EBM?
 - b) Discuss on various elements of Plasma Arc Machining System with sketch.

(6+3+6)

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Part: II
(50 Marks)

Answer question 1 and any two questions from the rest

1. Answer any four from the following:
 - (i) What is 'Non-Traditional Machining (NTM) Processes'? Identify and explain some of the major reasons for the development of NTM processes. 7
 - (ii) Classify NTM processes based on types of energy employed and mechanisms of material removal. 7
 - (iii) Differentiate various NTM methods based on process capabilities and economic considerations. 7
 - (iv) Deduce the mathematical formulation of electrolyte flow velocity in the machining zone for avoiding overheating of electrolyte due to heat generation by the flow of current during electrochemical machining operation. 7
 - (v) Explain in details one Hybrid Machining process. 7
 - (vi) Describe WEDM proces. Identify the major advantages and limitations of this machining process.

2. (a) Explain in brief a typical electrochemical machining plant with a sketch. 5
 (b) The equilibrium gap of ECM when machining of iron with NaCl solution is found to be 0.2 mm with operating voltage of 12 V. The density and valency of iron is 7.8 g/cm^3 and 2 respectively. The specific resistance of the electrolyte is 2.6 ohm-cm. The overvoltage is 1.5 V. Determine the metal removal rate/unit work surface area. 6

3. (a) Describe dynamics of ECM process and show variation of inter electrode gap under the condition of tool feed rate as constant. 6
 (b) State the reasons for which flowing electrolyte are necessary in ECM operation. 5

4. (a) State the basic principle of material removal in Electro Discharge Machining (EDM). 4
 (b) For electrodischarge machining of a 2.5 mm X 2.5 mm square through hole in a C-20 steel plate of 4 mm thickness, a copper tool is used with kerosene as dielectric. The resistance and capacitance of the relaxation circuit based spark generator is 110 Ohm and 10 μF respectively. The D.C. supply voltage has been 200V and the gap is maintained in such a value that the sparking can occur at 70V. Estimate the time required for drilling operation. 7

5. (a) Explain the characteristics variation of the voltage and current with respect to time in a Relaxation type of circuit of EDM and identify its limitations. 5
 (b) Describe the possible alteration in the surface of parts machined by Electro-Discharge Machining (EDM) process and how it can be minimized? 6