B. E. PRODUCTION ENGINEERING THIRD YEAR SECOND SEMESTER EXAMINATION 2025

NON-TRADITIONAL MACHINING

Full Marks: 100 Time: Three Hours

Part-I : (60 Marks)

Use Separate Answer scripts for each part.

*Answer Question 1 and any **TWO** Questions from the rest.*

1. Any Ten Questions:

a) Classify Energy Beam based advanced machining processes.
b) Why is ultrasonic machining recommended for machining glass?
c) State four applications of Laser Beam Machining.
d) What are the types of abrasives used in abrasive water jet machining?
e) State four applications of electrochemical discharge machining.
f) Why is Abrasive Jet Machining (AJM) not recommended for machining Plastic?
g) Why is vacuum needed in electron beam machining?
h) Compare ordinary light and Laser beam.
i) What are the types of Laser beam recommended for machining?
j) Mention four applications of plasma arc machining process.
k) State for applications of Electron Beam Machining.
l) Mention the name of abrasives used in Ultrasonic Machining.
m) Why Laser Beam can be applied for micro machining applications?

(10 x 2)

2. a) Write one sentence for each by matching the following one to one basis: (1 x 10)

A) USM	1) ablation
B) LBM	2) glass and ceramics
C) AJM	3) jet of mixture of abrasive and water
D) WJM	4) no tool Wear
E) AWJM	5) die surface
F) ECM	6) asbestos sheet
G) EDM	7) kerosene oil
H) WEDM	8) abrasive grain throwing and hammering
I) ECDM	9) air pollution
K) PAM	10) underwater cutting

b) An Ultrasonic Machining (USM) process has the following data:
Average diameter of abrasive particle is 50 micron. Amplitude of vibration is 25 micron. Frequency of vibration is 20 kHz. Abrasive slurry concentration by volume is 25 %. Density of workpiece is 3 g/cm^3. Volume of workpiece materials is 0.06 cm^3. Volume of Tool Wear is 0.003 cm^3. Machining time is 2 minutes. Force applied on the tool is 50 N.
Determine: i) Material Removal Rate (MRR) in g/min; ii) Tool Wear Rate (TWR);
iii) Required Power (P) in Watt and iv) Effective density of slurry.

(3+2+3+2)

3. a) Discuss on various elements of Abrasive Water Jet Machining (AWJM) System with sketch.

b) Distinguish between AJM and AWJM.

c) What are the applications and limitations of AJM?

(10+4+6)

4. a) Discuss on various elements of Plasma Arc Machining (PAM) System with sketch?

b) Describe on Material Removal Mechanism of USM.

c) Discuss on Stationary USM system with sketch. Distinguish between Rotary USM and Stationary USM.

(7+4+8)

5. Discuss on any two of the following NTM processes with sketch:

a) Nd:YAG Laser beam machining; b) Fiber Laser Beam Machining;

c) Electron Beam Machining; d) Electrochemical Discharge Machining.

(10+10)

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B. E. PRODUCTION ENGINEERING 3RD YEAR 2ND SEMESTER EXAMINATION, 2025

SUBJECT – **NON-TRADITIONAL MACHINING**

Time: Three hours **Full Marks: 100**

Use Separate Answer scripts for each PART

PART-II

Marks: 40

No of Questions		Marks
	Answer Question no. 1 and any two from the following	
1.	***Answer (i) any two from the rest:***	
	(i) Define 'Non-Traditional Machining (NTM) Processes' and classify NTM processes.	4
	(ii) Describe different electrolyte flow systems utilized in Electrochemical Machining (ECM).	3
	(iii) Show some practical design of flow path during machining of sharp and rounded corners.	3
	(iv) Describe the possible alteration in the surface layer after machining by Electro-Discharge Machining (EDM) process.	3
	(v) What is hybrid machining? Classify the types of hybrid machining.	3
2.	(a) What is "stray current" effect in ECM? How to minimize it?	4
	(b) Identify different variant of ECM and their machining applications.	5
	(c) The equilibrium gap of ECM when machining iron with NaCl solution is found to be 0.2 mm with operating voltage of 12 V. The density and valency of iron is7.8 g/cm^3 and 2 respectively. The specific resistance of the electrolyte is 2.8 ohm-cm. The overvoltage is 1.5 V. Calculate the metal removal rate/unit work surface area.	6
3.	(i) Explain the function of dielectric in EDM. What dielectric used for WEDM and why?	4
	(ii) Why wire tension is needed in WEDM? What is stratified wire?	4
	(iii) For electrodischarge machining of a 2.5 mm × 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 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
4.	(a) Differentiate between parameters of EDM and Wire-EDM.	4
	(b) Differentiate between conventional Grinding and Electrochemical Grinding (ECG).	4
	(c) Briefly explain laser assisted turning process and identify its advantages.	5+2