

Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (PE)/SEM-2/PEM-202/2010

2010

NON-TRADITIONAL MACHINING PROCESSES

Time Allotted : 3 Hours

Full Marks : 70

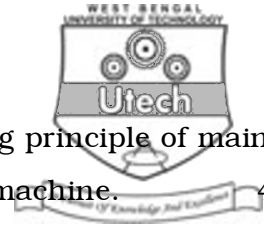
The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions taking at least *two* from each Group.

GROUP - A

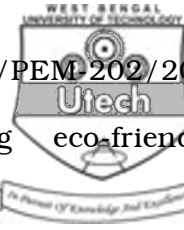
1. a) Develop a mathematical model relating MRR with the machining parameters in abrasive jet machining. 9
- b) How do the process parameters affect machining performance in ultrasonic machining process ? 5
2. a) Using USM process, glass is being machined at an MRR of $6 \text{ mm}^3/\text{min}$ by Al_2O_3 abrasive grits having grit diameter of $150 \mu\text{m}$. The feed force is increased by 60% along with a reduction in concentration by 40%. What would be the effect on MRR ? 3
- b) Describe micro-electromechanical system (MEMS) and its application. 6
- c) What do you mean by : "Class-10 clear room" ? 2
- d) Give reasons for inaccuracies in AJM process. 3



3. a) With neat sketch, discuss the working principle of main components of an ultrasonic drilling machine. 4
- b) In electrochemical machining (ECM) develop a model for material removal rate with material properties of engineering alloys. 7
- c) In electrochemical machining of pure iron a material removal rate of $700 \text{ mm}^3/\text{min}$ is needed. If density of iron is 7.8 gm/c.c. , estimate the required current. 3
4. a) Draw a sketch of abrasive water jet machining (AWJM) set-up, and briefly state the working principle of the system components. 7
- b) In AWJ machining, assuming no losses, water pressure is 5000 bar, being issued from an orifice of diameter 0.3 mm. Determine mass flow rate of water assuming all related coefficient to be 1. 4
- c) Explain why there exists an optimum S.O.D. for maximum stock removal rate of AWJ machining. 3

GROUP - B

5. a) Illustrate five different jobs that can be effectively manufactured using non-traditional machining processes rather than conventional machining processes. Give reasons, mentioning the processes to use. 5



- b) State the importance of adopting eco-friendly, sustainable manufacturing techniques. 5
- c) Briefly discuss about any two eco-friendly manufacturing methods. 4
6. a) Explain three theories behind the mechanism of material removal in EDM process. 4
- b) State with reasoning the polarity to adopt in tool and work piece electrodes in electrodischarge machining of thin foils. 3
- c) What is the use of servo mechanism in EDMing? 3
- d) With graphical representation, describe the effect of current and pulse-on time on EDMing performance. 4
7. a) Differentiate between plasma arc machining (PAM) with laser beam machining (LBM) in terms of applications of these processes. 3
- b) With schematic diagrams, compare direct with indirect arc system of PAM. 5
- c) Briefly outline the control parameters related to electron beam machining. 3
- d) State the properties of laser that help machining applications. Give reasons. 3

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8. a) With process schematic, describe the wire-cut EDM process, mentioning the process variables. 7
- b) Write short notes on any two of the following : $2 \times 3\frac{1}{2}$
- i) Use of rotary electrode and orbiting in EDM
 - ii) Requirement of gap flushing
 - iii) Recast layer on EDM surface
 - iv) Electrodischarge grinding.
9. a) Why is ultrasonic-assisted electrodischarge machining used ? 3
- b) "When usual grinding is not effective, electrochemical grinding is applied for defect-free grinding." Explain. 3
- c) Write short notes on any two of the following : 2×4
- i) Micro-EDMing
 - ii) Protein synthesis for component manufacture
 - iii) Selective etching for micro-product manufacture
 - iv) Use of CBN and diamond tools for micro-machining.

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