

**R13**

Code No: 117JH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, April/May - 2018

**UNCONVENTIONAL MACHINING PROCESSES**

(Mechanical Engineering)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART- A**

(25 Marks)

- 1.a) What is Hybrid Machining? [2]
- b) List the applications of unconventional machining process. [3]
- c) Define the term Electrolysis and Electrolytic cell. [2]
- d) Draw the schematic diagram of abrasive jet machining (AJM) setup. [3]
- e) List the unconventional machining processes that use thermoelectric methods. [2]
- f) What are the main functions of the dielectric fluid in electrodischarge machining? [3]
- g) What is the working principle in non-thermal Electron Beam Machining (EBM)? [2]
- h) Illustrate the applications of the Laser Beam machining (LBM). [3]
- i) What do you understand by the fourth state of matter? [2]
- j) Discuss the limitations of chemical machining. [3]

**PART-B**

(50 Marks)

- 2.a) Classify modern machining processes on the basis of the type of energy employed. Also, state the mechanism of material removal, transfer media, and energy sources used.
- b) Explain the methodology to recommend specific advanced machining processes for cutting a glass plate into two pieces. [5+5]

**OR**

- 3.a) Describe the structure and working of the transducer in an ultrasonic machine.
- b) Derive an equation suggested by Show to obtain volumetric material removal rate considering both throwing and hammering mechanisms. [5+5]

- 4.a) AJM is not recommended to machine ductile materials. Justify the statement.
- b) The volumetric flow rate of the carrier gas and abrasive mixture through a nozzle of diameter of 1mm in an AJM process is given by  $150 \text{ cm}^3/\text{s}$ . Determine the jet velocity.
- c) Enumerate the advantages and limitations of AJM Process. [10]

**OR**

- 5.a) Explain the mechanism of material removal during Electrochemical grinding (ECG) and how it is different from electro-chemical machining (ECM)
- b) During ECM of iron using aqueous solution of NaCl as electrolyte, what are the possible reactions at anode and cathode? [5+5]

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- 6.a) Explain the principle of electric discharge machining (EDM) with a neat diagram.  
b) During electric discharge drilling of a 15 mm diameter hole in a plate of 6.0mm thickness, brass as tool and kerosene as dielectric are used. The resistance and capacitance in the R-C circuit are  $50\Omega$  and  $20\mu\text{F}$  respectively. The supply voltage is 150V and the gap is maintained such that discharge takes place at the condition of maximum power delivery to the discharge circuit. Calculate the Material Removal Rate (MRR) in  $\text{mm}^3/\text{min}$ ; also calculate the approximate cycle time. Assume suitable constants. [5+5]

**OR**

- 7.a) Explain electric discharge grinding with a neat sketch.  
b) Illustrate the effect of magnitude of current, and frequency, on the shape and size of the craters formed during EDM. [5+5]
- 8.a) Explain with a sketch about the three important elements of EBM system.  
b) Write an equation to compute specific energy of vaporization. What is its significance? [5+5]

**OR**

- 9.a) LBM and EDM both are thermal processes. However, the first one results in more thermal damage to the machined component than the second one. Is it true? Justify.  
b) Explain the production of laser beam and working principle of LBM. [5+5]
- 10.a) Explain metal removal mechanism in Plasma Arc machining with neat sketch.  
b) Write a short note on Photoresist Maskant. [5+5]

**OR**

- 11.a) Explain the parameters that are affecting the performance of plasma arc machining.  
b) Why surface finish obtained in case of Chemical Machining of alloys is poor? Explain, in brief. [5+5]

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