



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## MODEL QUESTION PAPER-I

B. Tech V Semester End Examinations (Regular), May – 2020

**Regulations: IARE-R18**

### UNCONVENTIONAL MACHINING PROCESS

#### (MECHANICAL ENGINEERING)

**Time: 3 hours**

**Max. Marks: 70**

Answer ONE Question from each Module

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

#### MODULE – I

1. a) Explain the reasons for the development of Unconventional Machining Process with a neat sketch. [7M]  
b) Discuss in detail about the methods of generating the ultrasonic, characteristics of the various types of tool holder and tool feed mechanisms in USM. [7M]
  
2. a) How is the effect of amplitude and frequency of vibration on material removal and surface finish obtainable in ultrasonic machining.. [7M]  
b) Calculate the depth of indentation produced on a glass surface in ultrasonic machining by throwing action of abrasive grain of 100  $\mu\text{m}$  diameter. The following data are given. Amplitude of vibration = 0.1 mm, Frequency = 20kc/s. Abrasive density = 3.0  $\text{Kg/m}^3$ , Yield strength of glass =  $4.0 \times 10^{11} \text{ N/m}^2$ . [7M]

#### MODULE – II

3. a) Explain the effect of following parameters on the metal removal rate in AJM, Velocity of fluid, Design of nozzle, Gas pressure effect in AJM. [7M]  
b) Explain the principle of WJM? Describe the working of a WJM system with a neat Sketch [7M]
  
4. a) What is reaction are possible in cathode (tool) and anode (workpiece) in ECM process? (Assume electrolyte NaCl). What are the operations performed in ECM. [7M]  
b) In a certain electro chemical dissolution process of iron, a MRR of 2  $\text{cm}^3 / \text{min}$  was desired. Determine the amount of account of current required for the process. Assume Atomic weight of iron =56gm; Valency at which dissolution occur =2; Density of iron =7.8  $\text{gm/cm}^3$ . [7M]

#### MODULE – III

5. a) Develop an expression for MRR in EDM. Compare the R-C and R-C-L power operating circuit in EDM process. [7M]  
b) Discuss the advantages of EDM as compared to other non-traditional methods with regard to Metal removed rate, Accuracy and Surface finish. [7M]

6. a) Enumerate with neat schematic diagram principle of EDM, Mention selection of tool electrode and dielectric fluids in EDM process [7M]  
b) What are the desirable properties of a dielectric fluid? Gives some examples for dielectric fluids. Explain the functions of dielectric fluid. [7M]

#### **MODULE – IV**

7. a) Explain the basic components of Electron beam machining, why machining of electrically non-conducting materials using EBM process. [7M]  
b) Describe the construction and working of “Micro-Drilling” by LASER with a neat sketch. [7M]
8. a) Write an equation to compute specific energy of vaporization and mention the applications of EBM. [7M]  
b) Explain variation of temperature with distance from the surface for various pulse durations in EBM. [7M]

#### **MODULE – V**

9. a) Explain the principle of plasma arc machining with a neat sketch. State its advantages, limitations and application. [7M]  
b) What are the essential difference between a plasma arc cutting torch and welding torch. Discuss with neat sketch, metal removal mechanism in PAM. [7M]
10. a) With the help of suitable diagrams explain the use of various modes of plasma for various purposes in industry [7M]  
b) Explain the principle of plasma welding with a neat sketch. State its advantages, limitations and application [7M]



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## COURSE OBJECTIVES:

The course should enable the students:

I	Understand the need and importance of non-traditional machining methods and process Selection
II	Gain the knowledge to remove material by thermal evaporation, mechanical energy process.
III	Apply the knowledge to remove material by chemical and electro chemical methods.
IV	Analyze various material removal applications by unconventional machining process.

## COURSE OUTCOMES:

CO1	Compare non-traditional machining, classification, material applications in material removal process
CO2	Summarize the principle and processes of abrasive jet machining.
CO3	Understand the principles, processes and applications of thermal metal removal processes.
CO4	Identify the principles, processes and applications of EBM.
CO5	Understand the principles, processes and applications of Plasma Machining.

## COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

AMEB50.01	Understand of fundamentals of the traditional cutting tools compare it with other tools.
AMEB50.02	Identify and utilize fundamentals of metal cutting as applied to machining.
AMEB50.03	Understand a problem and apply the fundamental concepts and enable to solve problems arising in metal removal process.
AMEB50.04	Explore the ability to define and formulate the properties of cutting tool materials and characteristics.
AMEB50.05	Develop the skills of effective utilization of cutting fluids and applications for better productivity.
AMEB50.06	Competent to design and analyze problems of engineering particularly having relevance to manufacturing.
AMEB50.07	Comparison between non-traditional machining process with the traditional parameters, energy sources, economics of processes, shape and size of the material.
AMEB50.08	Identify ability to arrive at cutting parameters for machining.
AMEB50.09	Develop methods of working for minimizing the production cost.
AMEB50.10	Apply the best suitable advanced manufacturing process for processing of unconventional materials employed in modern manufacturing industries.
AMEB50.11	Study the parametric influences during processing of materials using developed models.
AMEB50.12	Relate distinctive knowledge of unconventional machining processes and performance parameters.
AMEB50.13	Apply unconventional machining process in various industrial applications.
AMEB50.14	Analyse and simulate various industrial problems in advanced machining processes.
AMEB50.15	Understand the applications of plasma machining.
AMEB50.16	Explore the use of modern engineering tools, software and equipment to prepare for competitive exams, higher studies etc.

### Mapping of Semester End Examinations to Course Learning Outcomes:

SEE Question No.		Course Learning Outcomes		CO's	Blooms Taxonomy Level
1	a	AMEB50.01	Understand of fundamentals of the traditional cutting tools compare it with other tools	CO1	Understand
	b	AMEB50.03	Understand a problem and apply the fundamental concepts and enable to solve problems arising in metal removal process.	CO1	Remember
2	a	AMEB50.04	Explore the ability to define and formulate the properties of cutting tool materials and characteristics.	CO1	Understand
	b	AMEB50.03	Understand a problem and apply the fundamental concepts and enable to solve problems arising in metal removal process.	CO1	Remember
3	a	AMEB50.08	Identify ability to arrive at cutting parameters for machining.	CO2	Understand
	b	AMEB50.08	Identify ability to arrive at cutting parameters for machining	CO2	Remember
4	a	AMEB50.08	Identify ability to arrive at cutting parameters for machining	CO2	Understand
	b	AMEB50.08	Identify ability to arrive at cutting parameters for machining	CO2	Remember
5	a	AMEB50.09	Develop methods of working for minimizing the production cost.	CO3	Understand
	b	AMEB50.13	Apply unconventional machining process in various industrial applications.	CO3	Remember
6	a	AMEB50.13	Apply unconventional machining process in various industrial applications.	CO3	Understand
	b	AMEB50.08	Identify ability to arrive at cutting parameters for machining.	CO3	Remember
7	a	AMEB50.15	Analyse and simulate various industrial problems in advanced machining processes using EBM and LBM	CO4	Understand
	b	AMEB50.15	Analyse and simulate various industrial problems in advanced machining processes using EBM and LBM	CO4	Remember
8	a	AMEB50.15	Analyse and simulate various industrial problems in advanced machining processes using EBM and LBM	CO4	Understand
	b	AMEB50.15	Analyse and simulate various industrial problems in advanced machining processes using EBM and LBM	CO4	Remember
9	a	AMEB50.16	Understand the applications of plasma machining and chemical machining.	CO5	Understand
	b	AMEB50.16	Understand the applications of plasma machining and chemical machining.	CO5	Remember
10	a	AMEB50.16	Understand the applications of plasma machining and Electro chemical machining.	CO5	Understand
	b	AMEB50.16	Understand the applications of plasma machining and chemical machining.	CO5	Remember

Signature of Course Coordinator

HOD, ME