SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur– 603203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

IV SEMESTER

ME3465 UNCONVENTIONAL MACHINING PROCESSES

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SUBJECT / SUBJECT CODE : UNCONVENTIONAL MACHINING PROCESSES/ ME3465
SEM/YEAR : IV / II

UNITI INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES			
Unconventional machining Process – Need – classification – merits, demerits and applications. Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining– Ultrasonic Machining - (AJM, WJM, AWJM and USM) - Working Principles – equipmentused – Process parameters – MRR- Applications.			
PART-A (2 Marks)			
Q.No	**QUESTIONS**	**LEVEL**	**COMPETENCE**
1	Identify why unconventional mechanical machining process is not popular?	BT1	Remember
2	List the importance of unconventional machining process.	BT2	Understand
3	Quote the requirements that demand the use of nontraditional machining processes.	BT1	Remember
4	Classify modern machining processes on the basis of the type of energy employed.	BT2	Understand
5	Summarize the requirements that demand the use of advanced machining process.	BT2	Understand
6	Summarize the advantages of unconventional machining process.	BT2	Understand
7	Quote the unconventional machining process which uses mechanical energy.	BT1	Remember
8	Distinguish between traditional and non-traditional machining.	BT2	Understand
9	Summarize the limitation of traditional machining processes.	BT2	Understand
10	Why abrasive jet machining is not recommended to machine ductile materials?	BT1	Remember
11	why reuse of abrasives is not recommended in abrasive jet machining process?	BT1	Remember
12	List the different type of abrasives used in AJM.	BT1	Remember
13	Summarize the applications of WJM.	BT2	Understand
14	Select any four process variables that control the material removal rate in AJM process.	BT1	Remember
15	Express the desirable properties of carrier gas in AJM.	BT2	Understand
16	Compare the WJM and AWJM.	BT2	Understand
17	List the limitation of WJM.	BT2	Understand
18	Enumerate the Process Capabilities of AWJM	BT1	Remember
19	Quote the limitations in ultrasonic machining.	BT1	Remember
20	List the functions of transducers in ultrasonic machining.	BT1	Remember

21	Identify the range of frequency required for ultrasonic machining.	BT1	Remember
22	Describe the functions of a horn in ultrasonic machining.	BT2	Understand
23	Classify feed mechanism.	BT1	Remember
24	Write the importance of surface finishing in machining operations.	BT2	Understand
25	Name the Unconventional machining processes which produce best surface finish.	BT2	Understand

PART-B (16 Marks)

Q.No	QUESTIONS	MARKS	LEVEL	COMPETECE
1	(i) Demonstrate the classification of modern machining process on the basic of energy employed. (ii)Describe the mechanism of material removal and energy transfer in each category.	8 8	BT3	Apply
2	(i)Analyze, why electro chemical process is found to be most potential process for gear finishing? (ii)Explain its principle, key process parameters and other applications.	8 8	BT4	Analyze
3	Explain the basis on selection of unconventional machining process for given job.	16	BT4	Analyze
4	How will you analyze the applicability of different processes to different type of materials namely metals, alloys and non metals?	16	BT4	Analyze
5	Discriminate the Abrasive Jet Machining, Water Jet Machining and Abrasive Water Jet Machining.	16	BT5	Evaluate
6	Classify the unconventional machining process, based on type of energy employed, MRR, transfer medial and energy resources used.	16	BT4	Analyze
7	Summarize the needs for development of unconventional machining processes? Explain with examples.	16	BT2	Understand
8	Explain the working principle of WJM with suitable diagrams.	16	BT4	Analyze
9	(i) Describe the factors that affect the performance of WJM. (ii) Discuss their effect of MRR.	8 8	BT3	Apply
10	Illustrate the schematic layout of abrasive jet machine and explain wear rate of nozzle in AJM.	16	BT3	Apply
11	Describe the apparatus, metal removal rate, process principles and application of Water Jet Machining.	16	BT3	Apply

12	Explain the principles, equipment, transducer, tool holders, tools, abrasives, applications, advantages of Ultrasonic Machining.	16	BT4	Analyze
13	Classify and explain the types of transducers used in USM	16	BT3	Apply
14	Describe the various types of tool holders and the tool feed mechanism in USM process.	16	BT3	Apply
15	Explain the following related to Ultra Sonic Machining: (i)Functions of slurry and oscillator in USM (ii)Grain size Vs Machining rate.	 8 8	BT4	Analyze
16	Illustrate schematic layout of abrasive jet machine and explain wear rate of nozzle in AWJM.	16	BT3	Apply
17	Describe the apparatus, metal removal rate and application of abrasive Water Jet Machining.	16	BT4	Analyze
18	Explain the characteristics of AWJM and USM.	16	BT4	Analyze

UNIT II THERMAL AND ELECTRICAL ENERGY BASED PROCESSES

Electric Discharge Machining (EDM) – Wire cut EDM – Working Principle-equipment Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits Tool Wear –Dielectric – Flushing – Applications. Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM) – Working Principles – Equipment –Types – Beam control techniques – Applications.

PART–A (2 Marks)

Q.No	QUESTIONS	LEVEL	COMPETENCE
1	List the applications of wire EDM.	BT1	Remember
2	List the desirable properties of a good dielectric fluid.	BT1	Remember
3	Give the roles of dielectric fluid in EDM	BT2	Understand
4	List the types of EDM flushing techniques.	BT1	Remember
5	Indicate the range of pulse duration and current in EDM.	BT2	Understand
6	Name the most commonly used spark generating circuits.	BT2	Understand
7	How to minimize tool wear in EDM.	BT1	Remember
8	What is an arc gap? How is the arc gap controlled in EDM.	BT1	Remember
9	Quote the dielectric fluids used in EDM.	BT1	Remember
10	Distinguish wire cut EDM and EDM process.	BT2	Understand
11	Assess the influence of current in MRR in EDM process.	BT1	Remember
12	Assess the ways of gap-flushing used in EDM.	BT1	Remember
13	List the factors affecting metal removal rate.	BT1	Remember
14	Classify the tool materials in EDM.	BT1	Remember
15	Interpret the meaning of plasma.	BT2	Understand
16	Summarize the advantage of EBM over LBM.	BT2	Understand
17	How Plasma arc used in the Machining Process.	BT1	Remember
18	Define the principle of electron beam machining.	BT1	Remember
19	Give the wear ratio for Brass, Copper, copper tungsten and non metallic electrode.	BT1	Remember
20	Summarize the advantages of Plasma Arc Machining.	BT2	Understand
21	Classify the various types of lasers.	BT1	Remember
22	Distinguish between the vacuum and non-vacuum EBM.	BT2	Understand
23	Describe the Acronym of LASER?	BT1	Remember
24	List the function of electron beam gun?	BT1	Remember
25	Summarize the commonly used gas mixture in PAM.	BT2	Understand

PART-B (16 Marks)				
Q.No	**QUESTIONS**	**MARKS**	**LEVEL**	**COMPETECE**
1	Briefly explain various types of dielectric fluid and its functions in EDM process.	16	BT3	Apply
2	Explain the general arrangement of an Electrical discharge machining process and list out its advantages, disadvantages, and applications of EDM.	16	BT4	Analyze
3	Explain the principle, construction and working of Wire-cut electrical discharge machining process and state its merits and demerits.	16	BT3	Apply
4	Explain and illustrate metal removal process in EDM.	16	BT4	Analyze
5	Explain the following on wire EDM technology. (i) Dielectric system (ii) Deionized water	 8 8	BT4	Analyze
6	Analyze the break down mechanism in EDM process.	16	BT4	Analyze
7	Explain the three types of spark generators used in EDM.	16	BT4	Analyze
8	Illustrate and explain the types of tool wear in EDM process.	16	BT3	Apply
9	Explain how MRR and quality is controlled in EDM process.	16	BT4	Analyze
10	Explain the classification and characteristics of various spark erosion generators.	16	BT4	Analyze
11	Examine how laser is used to machine the materials.	16	BT3	Apply
12	Summarize the process parameters of LBM and influence on machining quality.	16	BT5	Evaluate
13	Explain the following in LBM process. (i)Advantages (ii)Disadvantages (iii)Application	 6 4 6	BT4	Analyze
14	Illustrate and explain the principles of EBM with neat sketch.	16	BT3	Apply
15	Point out the control of following parameters in EBM. (i) Current (ii)Spot-diameter (iii)Focus distance of magnetic lens	 5 5 6	BT4	Analyze
16	Briefly explain on under water plasma cutting.	16	BT4	Analyze

17	Explain the thermal features of Laser beam machining. Discuss the performance of various types of Lasers.	16	BT4	Analyze
18	Describe the principle, equipment, solid state laser, gas laser thermal features applications and advantages of Plasma Arc Machining.	16	BT3	Apply

UNIT III CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES			
Chemical machining and Electro-Chemical machining (CHM and ECM) - Etchants – Maskant – techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications. Principles of ECM-Equipment-Surface Roughness and MRR Electrical Circuit-Process Parameters ECG and ECH - Applications.			
PART–A (2 Marks)			
Q.No	**QUESTIONS**	**LEVEL**	**COMPETENCE**
1	Describe the principle of chemical machining process.	BT1	Remember
2	Write the Faraday's first law of electrolysis?	BT2	Understand
3	What are the properties are expected from the electrolysis used in the ECM?	BT2	Understand
4	List the three different layers that can be identified in spark eroded surface.	BT1	Remember
5	Summarize the factors that affect MRR in ECM.	BT2	Understand
6	Define maskants in Electrochemical machining process.	BT1	Remember
7	What do you understand by charging of electrolyte?	BT2	Understand
8	Summarize the application of ECM.	BT2	Understand
9	What are the results due to improper selection of electrolyte in ECM?	BT2	Understand
10	How the current density affect the MRR.	BT2	Understand
11	Name the electrolytes which are used in electro chemical machining.	BT1	Remember
12	Discriminate the process of CHM and ECM.	BT2	Understand
13	What is etchant in chemical machining process?	BT1	Remember
14	Summarize the advantages of ECM process.	BT2	Understand
15	Differentiate the advantages of ECG over conventional grinding.	BT2	Understand
16	List the application of electro chemical grinding.	BT1	Remember
17	Summarize the parameters that affect the material removal rate in Electro chemical Grinding.	BT2	Understand
18	Quote the main difference between electroplating and ECM.	BT1	Remember
19	Define the principle of electro chemical grinding process.	BT1	Remember
20	What is meant by electro chemical honing process?	BT2	Understand
21	List the advantages of ECH process.	BT1	Remember
22	Define surface roughness.	BT1	Remember
23	List the process parameters of ECG process.	BT1	Remember
24	List the application of ECH process.	BT1	Remember
25	What are the factors to be considered while designing the tool?	BT2	Understand

PART-B (16 Marks)				
Q.No	**QUESTIONS**	**MARKS**	**LEVEL**	**COMPETENCE**
1	Illustrate with the help of a simple diagram, explain the working of Electro-chemical machining process.	16	BT3	Apply
2	Explain the principle of electro chemical deburring process.	16	BT4	Analyze
3	Explain the characteristics of ECM.	16	BT4	Analyze
4	Explain in detail about the types of maskants used in chemical machining.	16	BT4	Analyze
5	Explain the followings with respect to chemical machining process (a) Characteristics of cut and peel maskants. (b) Selection of maskants. (c) Limitations.	 6 6 4	BT4	Analyze
6	Illustrate the following with suitable sketch. (i)Electro Chemical Machining process. (ii)Cathode tool and correction tool.	 8 8	BT3	Apply
7	(i) With a neat sketch, explain the principle of electro-chemical grinding. (ii)State its process capabilities and application	 8 8	BT4	Analyze
8	Explain the electro-chemical Honing process with a neat sketch.	16	BT4	Analyze
9	Explain the characteristics of ECH.	16	BT3	Apply
10	Compare the Chemical Machining (CHM) with Electro-Chemical Machining (ECM) with respect to their process parameters.	16	BT5	Evaluate
11	Explain a neat sketch, explain the chemical machining process.	16	BT3	Apply
12	Discuss the effect of high temperature and pressure of electrolyte of ECM process.	16	BT3	Apply
13	Explain the process parameters MRR and surface finish in CHM.	16	BT4	Analyze
14	Describe the Various characteristics of ECH.	16	BT4	Analyze
15	Explain the requirement of tool material for ECM process and write the commonly used tool materials.	16	BT4	Analyze

16	Measure amount of current required the iron is subjected to ECM process. The metal removal rate of iron is $4cm^3/min$. assuming atomic weight iron N=56 Kg, valancy n=2, density of iron ρ = 7.787 g/cm^3.	16	BT5	Evaluate
17	Formulate the MRR by ECG comprise and summarize the functions of abrasive particles.	16	BT6	Create
18	Describe the various elements of chemical machining. What are the factors on which the selection of a resist for use in chemical machining?	16	BT4	Analyze

UNIT IV ADVANCED NANO FINISHING PROCESSES			
Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magnetorheological abrasive flow finishing their working principles, equipment, the effect of process parameters, applications, advantages and limitations.			
PART–A (2 Marks)			
Q.No	**QUESTIONS**	**LEVEL**	**COMPETENCE**
1	Define abrasive flow machining.	BT1	Remember
2	What is Nano finishing process?	BT2	Understand
3	Which is not the type of abrasive flow finishing process?	BT1	Remember
4	What is the major difference between ER and MR fluids?	BT2	Understand
5	Classify AFM.	BT1	Remember
6	Summarize the components of AFM process.	BT2	Understand
7	List the process input parameters of AFM.	BT2	Understand
8	Quote the operating range of AFM.	BT1	Remember
9	Compare the difference between one way and two way AFM.	BT2	Understand
10	List the advantages of one way AFM.	BT1	Remember
11	Summarize the applications of AFM.	BT2	Understand
12	Which ratio defines the etch factor?	BT1	Remember
13	List the types of surface finishing.	BT2	Understand
14	Define Chemical-mechanical polishing.	BT1	Remember
15	Define Damascene process.	BT1	Remember
16	Express the use of PVA in CMP.	BT2	Understand
17	Summarize the role of slurry in CMP process.	BT2	Understand
18	Quote any two applications of CMP.	BT1	Remember
19	List any two advantages of CMP.	BT1	Remember
20	What is meant magnetorheological finishing?	BT1	Remember
21	List the components of MR fluid.	BT1	Remember
22	Describe the desired properties of MR fluid.	BT2	Understand
23	Quote any two advantages of MRF.	BT1	Remember
24	List the limitations of MRF process.	BT1	Remember
25	List the applications of MRAFF process.	BT1	Remember

PART-B (16 Marks)				
Q.No	**QUESTIONS**	**MARKS**	**LEVEL**	**COMPETENCE**
1	Briefly explain the role of CMP in Semiconductor manufacturing.	16	BT4	Analyze
2	Explain about the origin and evolution of CMP process.	16	BT5	Evaluate
3	Illustrate the Copper dual-damascene process with a suitable sketch.	16	BT3	Apply
4	Explain the working of CMP Planarization process.	16	BT4	Analyze
5	Explain the working principle of AFM with a neat sketch.	16	BT3	Apply
6	Illustrate the process parameter and process capabilities of AFM.	16	BT3	Apply
7	Illustrate and explain one way and two way AFM with neat diagram.	16	BT3	Apply
8	Write in details about the process parameters of AFM and evaluate the effect, on output responses.	16	BT5	Evaluate
9	(i) Describe the working principle of orbital AFM. (ii)Write about the operating range and advantages of AFM.	8 8	BT3	Apply
10	Explain in detail about the MR fluid in Magnetorheological Finishing process.	16	BT4	Analyze
11	Explain the characteristics of the MRF process.	16	BT4	Analyze
12	Illustrate with a neat sketch explain the schematic of MR finishing.	16	BT3	Apply
13	Summarize and explain the process parameters of MRF and their applications.	16	BT5	Evaluate
14	Write about the magnetic abrasive finishing process working principle with a neat diagram.	16	BT3	Apply
15	Discuss about the magnetorheological polishing fluid.	16	BT3	Apply
16	Describe the characteristics of the MRAH process.	16	BT4	Analyze
17	Explain the equipments, effect of process parameters, applications, advantages, and limitations MRAH.	16	BT4	Analyze
18	Illustrate the mechanism of magnetorheological abrasive honing (MRAH) with suitable sketch.	16	BT3	Apply

UNIT V MICROFABRICATION TECHNOLOGY

Rapid prototyping- classification of rapid prototyping techniques-steps of rapid prototyping -Stereolithography (SLA), Selective laser sintering (SLS)-Fused Deposition Modelling (FDM)- processes, working principles, advantages, disadvantages, applications, limitations.

PART–A (2 Marks)

Q.No	QUESTIONS	LEVEL	COMPETENCE
1	Why rapid prototyping is important in industries.	BT1	Remember
2	How rapid prototyping systems are classified.	BT2	Understand
3	List the key aspects of rapid prototype technologies.	BT1	Remember
4	What meant by rapid prototype.	BT1	Remember
5	What are the roles of prototype in development processes	BT1	Remember
6	What is historical development of RP?	BT1	Remember
7	What are the steps involved in rapid process chain?	BT2	Understand
8	Classify the rapid prototyping systems.	BT2	Understand
9	List out the advantages of rapid prototyping process.	BT2	Understand
10	List the limitations of rapid prototyping.	BT2	Understand
11	Establish a statement how rapid prototyping is used in automation.	BT1	Remember
12	List out fundamental automated processes?	BT1	Remember
13	What is the difference between CNC and RP?	BT2	Understand
14	Define photo polymerization.	BT1	Remember
15	What is Meant By SLA?	BT1	Remember
16	List the materials used in SLA.	BT2	Understand
17	What is Meant By SLS?	BT2	Understand
18	Compare SLA and SLS.	BT1	Remember
19	List the application of FDM.	BT1	Remember
20	Why support structure is needed.	BT1	Remember
21	Compare liquid and solid RP Techniques.	BT1	Remember
22	What are the softwares used for Tool path generation?	BT2	Understand
23	List the application of SLS.	BT1	Remember
24	What is model slicing.	BT1	Remember
25	List the disadvantages of FDM.	BT1	Remember

PART-B (16 Marks)				
Q.No	**QUESTIONS**	**MARKS**	**LEVEL**	**COMPETENCE**
1	Why rapid prototyping is important in industries.	16	BT3	Apply
2	Explain the rapid proto typing systems.	16	BT4	Analyze
3	Explain the key aspects of rapid prototype technologies.	16	BT3	Apply
4	Discuss the evolution of RP systems indicating the history and their growth rate in the industrial sector.	16	BT4	Analyze
5	Explain rapid tooling wheel.	16	BT3	Apply
6	Discuss the steps followed in rapid prototyping process.	16	BT4	Analyze
7	Describe the role of RP in product development.	16	BT3	Apply
8	Explain the stages of RP Process.	16	BT4	Analyze
9	Discuss about photo polymerization.	16	BT2	Understand
10	Describe the principle of working of Stereo lithography system.	16	BT3	Apply
11	Explain the concept of support structure generation.	16	BT4	Analyze
12	Discuss the suitable measures to reduce distortions in SLA process.	16	BT3	Apply
13	Explain the process details on the quality of product in SLA.	16	BT3	Apply
14	Compare STL and FDM with application aspects.	16	BT4	Analyze
15	Explain the applications of FDM.	16	BT3	Apply
16	With an example explain path generation in FDM process.	16	BT4	Analyze
17	Explain the working principle and details of process parameters of an FDM machine.	16	BT4	Analyze
18	Discuss the process parameters of FDM.	16	BT3	Apply