



ST.ANNE'S COLLEGE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE, New Delhi. Affiliated to Anna University, Chennai)

Accredited by NAAC

ANGUCHETTYPALAYAM, PANRUTI – 607 106.

DEPARTMENT OF MECHANICAL ENGINEERING

CME 387 - NON TRADITIONAL MACHINING PROCESS

REGULATION - R-2021

THIRD YEAR - SIXTH SEMESTER

PREPARED BY

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UNIT I

INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES

Part-A (2 Mark questions)

1. Define non- traditional machining processes (or) Unconventional machining process.(Non/Dec 2021)
2. What is meant by conventional machining processes?
3. What are difference between non-traditional machining process and traditional machining process? (Nov/Dec-2016) (Or) Difference between conventional and unconventional machining processes. (May/June-2021)
4. State the industrial needs/necessity of Unconventional machining process.(May/June-2010, 2015,2016,2014, 2021, Nov/Dec -2013,2014,2016,2021)
Merits (advantages) of unconventional machining process.(Apr/May-2011),(May/June-13,16)
5. What is the importance of unconventional machining? (May / June 2006) (Nov/Dec 2023)
6. List down various mechanical energy based Unconventional machining processes (Nov/Dec-2004& Apr/May-2010,2021)
7. What are the different machining characteristics with respect to which the non-traditional machining processes can be analysed? (Nov/Dec-2008)
8. What are the machining characteristics with respect to which the non- traditional machining process can be analysed? (Nov/Dec 2008) (Apr/ May 2011)
9. Distinguish traditional and non-traditional machining processes. (Apr/May-15, Nov/Dec-16, Nov/Dec 2019)
10. Mention thermal energy based unconventional processes. (May/June-2012)(May/June-2013)
11. Why unconventional mechanical machining process is not so effective on soft materials like aluminium? (Apr/May-2008, Nov/Dec 2019)
12. How non- traditional machining Process is classified? (Nov/Dec 2005,Nov/Dec-2013)
13. List out the limitations of traditional machining processes. (Nov/Dec 2014, Nov/Dec-2015, May 2019)
14. List the unconventional machining based on chemical energy? (Nov/Dec-2015) (May/June-16)
15. What are thermal energy methods of unconventional machining? (May/ June-2012,May/Jun-2013)

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16. List the unconventional machining process which uses mechanical energy. (Nov/Dec 2004) (Apr/May 2010)
 17. What are the characteristics of UCMP? (Nov/Dec 2004) (Nov/ Dec 2007)
 18. What are the desirable properties of carrier gas in AJM? (Nov/Dec 2004) (Apr/May 2018)
 19. What are the different types abrasives used in AJM?(Apr/May-2010)(Nov/Dec-16)
 20. What are the desirable properties of carrier gas in AJM?(Nov/Dec-2004)(May/June2012,May 2019)
 21. Why abrasive jet machining is not recommended to machine ductile materials? (Apr/May-2011) (Nov/Dec 2014)
 22. Mention the Process parameters affecting the MRR in AJM? (Nov/Dec 2013) (Nov/Dec 2018) (or) What are the process parameters affecting the material removal rate in AJM? (Nov/Dec 2019)
 23. What is the principle of WJM? (Nov / Dec 2005) (Apr/May 2018)
 24. List out the parameters which improve the material removal rate in water jet machining. (Apr/May 2010, Nov/Dec 2007, 2021)
 25. What are the applications of WJM? (Nov/Dec-16, Apr/May-2015,May/June-16)
 26. What is ultrasonic machining? (Or) State the working principle of USM. (Apr/May-2015,18)(May/June-16)
 27. Outline the properties of tools used in USM process. (Apr/May-2023)
 28. What are the characteristics of a good suspension media of the USM Process? (Apr/May2008),(Apr/May2005)(May/June2013)(Nov/Dec 2014)
 29. - What are the Disadvantages of USM? Or State the demerits of the ultrasonic machining. (Nov/Dec 2021)
 30. Name the different abrasive used in abrasive jet machining process. (Nov/Dec 2019)

PART –B & C (13- and 15-Marks Questions)

1. What is the need for development of unconventional machining processes? Explain with examples. (Apr/May-2010 & May/June-2007)(Nov/Dec 2013), what are the basic limitations of unconventional manufacturing processes? Justify the need of

unconventional manufacturing process in today's industries. (May/June 2014,Nov/Dec-2015, Nov/Dec 2019)

2. Differentiate between conventional and unconventional machining processes. Discuss the reasons for the development of unconventional machining methods. (Nov/Dec2014) (May/June-16) Nov/Dec 2023

3. How are the Unconventional machining process classified? (May/June-2012) Nov/Dec 2023

4. Describe the Principle and Equipment for AJM.(May/June-11, 16)(Nov/Dec-13,15,16) (Nov/Dec-2004)

Explain the principle of AJM. Mention some of the specification. (April/May 2008)

Explain with neat sketch the working principle and parametral influence of abrasive jet machining.(Nov/Dec 2021)

Write its advantages and disadvantages. (April/May 2010) (April/May 2015. May 2019) (April/May 2012) (May/June 2008, 2014, 2021)

5. Explain the principle of working and equipment of water jet machining with a neat diagram. (May/June-2012,2021) (Nov/Dec-2008,2014,2015,2018)

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6. Explain the working principle and equipment of Ultra Sonic Machining with a neat sketch. Mention its applications, advantages and limitations. (May/June-2016) (Nov/Dec 2013) (May/June 2014) (Nov/Dec -14,15,16) (Nov/Dec 2019) (Apr/May-2023)

UNIT II

Part-A

1. State the principle of chemical machining process
2. What are the parameters that affect the MRR in chemical machining? (May/June-2012)
3. State the advantages of chemical machining. (May/June-2007)
4. What is meant by etch factor? (Apr/May-2008) ? (Nov/Dec2022)
5. Define electro chemical machining (ECM)? (Nov/Dec2004) **Nov/Dec 2023**
6. Write the Faraday's first law of electrolysis?
7. Write the Faraday's second law of electrolysis? (May/June-2021)

8. What are the materials used to make the tool electrode in ECM? (Apr/May-2005)
9. Write the difference between Chemical Machining and Electro Chemical Machining. (Apr/May-2011)
10. What are the main functions of electrolysis in the ECM? (May/June-2006 & Nov/Dec-2006) (May/June 2014) (Nov/Dec 2014)
11. What are the properties expected from the electrolysis used in the ECM? (Nov/Dec-13)(May/June-16)
12. What are the electrolytes commonly used in ECM? (Apr/May-2005, May/June-2007)
13. What are the different types ECM operations? (May/June-2021)
14. What are the process parameters of ECM? (Apr/May-2005)(Or)List the factors that affect MRR in ECM? (Nov/Dec-16)
15. What is the self-adjusting feature in ECM? (Apr/May-2008)
16. Please identify the principle of ECM. How does it differ from electroplating? (Nov/Dec-2008, May/June-16, Apr/May-2010)
17. What are the advantages of ECM? (Nov/Dec-13)(May/June-16) (Apr/May-2023)
18. What are the limitations of ECM? (Nov/Dec-2007)(Nov/Dec-2013)(May/June-16)
19. What are the applications of ECM? (Nov/Dec2006)
20. Define masking in electro chemical machining. (Nov/Dec 2021)
21. What is meant by maskant in CHM/ECM? (Apr/May-15)
22. List out the types of etchants used in chemical machining. (or) What are the etchants in chemical machining process? (Nov/Dec-15,2021)
22. List the commonly used maskant in Chemical Machining Process. (May/June2013)
23. What are the important functions of abrasive particles used in ECG?

24. Why the life of Electro Chemical Grinding (ECG) wheel is much higher than Conventional grinding wheel? (Apr/May-2011) (Nov/Dec 2022)
25. List the applications of Electro Chemical Honing (ECH). (Apr/May-2010, Apr/May-2015)
26. Write the formula for finding the MRR in ECG process. (May/June2013)
27. How does electrochemical deburring take for electrochemical grinding? **Nov/Dec 2023**

Part-B & C (13 and 15 Mark Questions)

1. Explain the principle of working, equipment, Applications, Advantages and drawbacks of chemical machining and chemical milling (May/June-13, 16)(Nov/Dec-13, 15 Apr/May-15) (Apr/May-2023)
2. Explain the principle of working, equipment's, Applications, Advantages and drawbacks of Electro chemical machining (May/June-14,16, 21)(Nov/Dec-16) (Apr/May-2015) (Nov/Dec 2021)
3. Explain the principle, working, equipment's and Applications of Electro Chemical Grinding (May/June-10, 12, 15, 16, 21), (Nov/Dec-13, 15, 16) (Nov/Dec 2021) (Apr/May-2023)
4. Explain Electro chemical Honing process with neat sketch? (May/June-16) (Nov/Dec-14,15)
5. Briefly discuss Electro Chemical Deburring process? (Nov/Dec 2014)

UNIT – III

THERMAL AND ELECTRICAL ENERGY BASED PROCESSES

Part A (2 Marks)

1. What is the working principle of Electrical discharge machining process?
2. How the tool materials are classified in EDM? (May / June 2007)
3. Brief the material removal mechanism in EDM process. (Apr/May-2023)
4. Define tool wear ratio. Or Define the tool wear ratio in EDM.(Nov/Dec 2022)
5. Mention few types of power supply circuits used in EDM? (Nov./Dec. 2007, 2008, May/June-2021)
6. What the dielectric fluids commonly used in EDM?
7. What kind of dielectric fluid is commonly used in wire electric discharge machining?
Nov/Dec 2023
8. What are the various materials of which electrode are made for EDM process and what are their advantages? (Nov/Dec 2021)
9. What are the desirable properties of good dielectric fluid? (Nov / Dec 2005), (Apr / May 2010)
10. What are the functions of an adoptive control system used for EDM?(April / May 2008)
(May/ June 2012)
11. What is the principle of operation of wire-cut EDM process? (Nov/ Dec 2008)
12. State the difference between the wire cut EDM and EDM.(Nov/ Dec 2006)
13. What is the principle of LBM? (Nov/Dec-2005, 15)
14. State the characteristics of laser beam. (Nov/Dec-2006) (Nov/Dec-13)
15. State the types of lasers used in manufacturing operation. (Nov/Dec 2021)
16. What is meant by laser beam drilling? (Apr/May-15)
17. What do you mean by plasma? (Nov/Dec-2016)
18. What is the principle of PAM? (May/Jun-2009), (May/Jun-2016)
19. Can you machine electrically non-conductive materials by PAM? Justify your answer.
(Apr/May-2011)
20. What is transferable and non-transferable arc in Plasma Arc Machining? (Nov/Dec-2004)(May/Jun-2012)
21. List any two gases used in PAM. (Apr/May-2005)
22. Write the advantages of Plasma Arc Machining? (May/Jun-14)
23. What are the limitations of EBM? (Nov/Dec-2004) (Apr/May-2023)
24. Contrast LBM and EBM. (Nov/Dec-2005), (May/Jun 2014) (Nov/Dec 2016)

25. Why vacuum is needed in Electron Beam Machining Processes? (May/Jun-2009), (Apr/May-2011)
26. What are the techniques used for controlling beam in EBM Process (May/Jun-2016, Apr/May- 2015)

PART-B (13 Marks and 15 marks)

1. Explain the EDM process and list its advantages, disadvantages and applications (Nov/Dec-2008, 2016), (Apr/May-20011, 2014, 2016) (Nov/Dec 2021)
2. Explain the Wire cut EDM and list its advantages, disadvantages and applications (Apr/May-2010, Nov/Dec-16) (May/Jun-14, 16) (Nov/Dec- 15) (Apr/May-15)
Travelling Wire Electro-Discharge Machining (TWEDM) or Wire cut EDM
Outline wire cut EDM with a neat sketch and explain its significant process parameters for good surface finish. (Apr/May-2023)
3. Explain the process parameters which govern the EDM/ Wire cut EDM process. (Nov/Dec-2013, May/June-2021) (Nov/Dec 2021)
4. Discuss in detail about the thermal feature and analysis of laser beam machining
Thermal Feature and Analysis of Laser Beam Machining:
5. What is the principle of plasma arc machining? What are the two stages in which the process of material removal is affected? What is the main industrial application of plasma cutting systems? (Nov/Dec-08, 15) (Apr/May-2015) (May/June-2021)
6. Explain the principle, equipment, working, advantages, limitations and applications of Electron Beam Machining [EBM].(Apr/May-2010),(Apr/May-2011), (May/Jun-2012)&(May/Jun-2013) (Nov/Dec-14,15)(Apr/May-2015)
7. Explain the principle, equipment, working, advantages, limitations and applications of Ion Beam Machining [IBM] **Nov/Dec 2023**
8. Compare and contrast the applications advantages and limitations of wire electric discharge machining and electric discharge machining. **Nov/Dec 2023**
9. Explain the differences between laser beam machining and electron beam machining in terms of the principles, equipment used application under potential challenges. **Nov/Dec 2023**

UNIT IV

NANO FINISHING PROCESSES

1. Write the principle of abrasive flow machining process.
2. List out the types of abrasive flow machining processes.
3. Define one way AFM.
4. List out the Advantages of One-way AFM:
5. Define two way AFM.
6. What are the Advantages of Two-way AFM?
7. Define orbital AFM.
8. List out the elements of AFM.
9. List out the two aims of Tooling for AFM machine.
10. Write the process parameters of abrasive flow machining. (May/June-2021)
11. Write the working principle of Chemo mechanical polishing.
What is chemo-mechanical polishing? **Nov/Dec 2023**
12. What are the slurry used in CMP Processes?
13. List out the applications of CMP Process.
14. Write the working principles of magnetic abrasive finishing process.
State the principle of magnetic abrasive finishing process. (Nov/Dec 2022)
15. List out the applications of Magnetic abrasive finishing processes.
State the applications of magnetic abrasive finishing. **Nov/Dec 2023**
16. What is the purpose of abrasives in the magnetic abrasive finishing process? (Apr/May-2023)
17. Write down the principle of magneto rheological finishing. (Nov/Dec 2021)
18. Draw the diagram for Magneto rheological finishing.
19. State the materials preferred as an abrasive particle and its size in nano finishing.
Nov/Dec 2021)

Types of abrasives used are Al_2O_3 , Sic, cubic boron nitride (CBN) and diamond.

20. Define the magneto-rheological effect. (Nov/Dec 2022)

Magnetorheological (MR) fluids are a class of smart materials whose yield stress increases considerably in the presence of externally applied magnetic field. These fluids are composed of soft, spherical, magnetic particles whose diameters range from 0.01 to 20 μm dispersed in an organic liquid.

PART-B (13 and 15 Marks)

1. **Explain Abrasive flow machining process principles, working, process parameters, advantage, disadvantage and application in details. Nov/Dec 2023**
Discuss the abrasive flow machining with a neat illustration and mention its applications. (Apr/May-2023)
2. **Explain Chemo-Mechanical Polishing process principles, working, process parameters, advantage, disadvantage and application in details. (July 2021) (Nov/Dec 2021)**
3. **Explain Magnetic abrasive finishing process principles, working, process parameters, advantage, disadvantage and application in details. (Nov/Dec 2021) (Apr/May-2023)**
4. **Explain Magneto rheological finishing process principles, working, process parameters, advantage, disadvantage and application in details. Nov/Dec 2023**
5. **Explain Magneto rheological abrasive flow finishing process principles, working, process parameters, advantage, disadvantage and application in details (July 2021)**
6. **Discuss the importance and emergence of nano finishing processes in detail. (Nov/Dec 2021)**

UNIT – V

Hybrid Non-Traditional Machining Processes

PART- A

(2 MARKS)

1. What is a hybrid process?
2. List the needs for hybrid machining processes. (April/May 2023)
3. How material removal takes place in Electro Chemical Spark Machining?
4. Write down the chemical reaction in ECSM?
5. What are the applications of ECSM?
6. Why do we choose electric discharge diamond grinding?
7. Name the dielectric fluids used in EDDG.
8. Name the two configurations used in EDDG.
9. List the advantages of EDDG.

Write the advantages of hybrid non-traditional machining processes. **Nov/Dec 2023**

10. Define Faraday's law of electrolysis.
11. List the function of electrolyte in ECMM.
12. Why sodium nitrate is more advantage in ECMM?
13. List the application of ECMM.
14. List the types of thermal advanced micromachining processes.
15. List two examples of hybrid non-traditional machining processes. **Nov/Dec 2023**
16. Name the work piece materials used in EDMM.
17. What are the main components of EBMM?
18. List the applications of EBMM?
19. What are the types of laser used in LBMM?
20. Write down the reaction that takes place in ECMM.
21. List the applications of LBMM?
22. Define Micro machining.
23. What are the mechanical advanced micro machining processes?
24. Detail the type of nozzle used in AJMM.
25. Detail the focus tube used in AJMM.
26. List the functions of slurry used in USMM.
27. Mention the limitations of non-traditional machining process. (Apr/May-2023)

PART- B & C (13 & 15 MARKS)

- 1. Explain the benefits of hybrid unconventional machining technologies and elaborate on the challenges and opportunities. (Apr/May-2023)**

While hybrid non-traditional machining processes offer many advantages, they also come with specific challenges. Discuss these limitations and potential solutions to address them.

Nov/Dec 2023

- 2. Explain with neat sketches of Electrochemical Spark Machining.**
- 3. Explain the various applications of hybrid non traditional machining processes across industries. Nov/Dec 2023**
- 4. Explain working principle of electrical discharge diamond grinding with neat sketch.**
- 5. Explain the working of Abrasive Jet Micro Machining.**
- 6. Explain the working of Abrasive Water Jet Micro Machining.**
- 7. Ultrasonic Micro Machining:**
- 8. Explain EDM process with neat sketch.**
- 9. Explain the principle of Electron Beam Micro Machining Process**
- 10. Laser Beam Micromachining Process:**
- 11. Electro Chemical Micro Machining**
- 12. Explain the recent developments in non-traditional machining processes. (Nov/Dec 2021)**
- 13. Explain the working principle of 3D printing technology for the production of parts. (July 2021)**
- 14. Compare and contrast the principles of operation between abrasive jet machining, abrasive water jet machining and ultrasonic machining. Nov/Dec 2023**