

JEPPIAAR ENGINEERING COLLEGE

Jeppiaar Nagar, Rajiv Gandhi Salai – 600 119

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK



VI SEMESTER

ME6004 – UNCONVENTIONAL MACHINING PROCESSES

Regulation – 2013



JEPPIAAR ENGINEERING COLLEGE

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DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

SUBJECT : ME6004-UNCONVENTIONAL MACHINING PROCESSES
YEAR /SEM: III /VI

UNIT I INTRODUCTION				
Unconventional machining Process – Need – classification – Brief overview.				
PART – A				
CO Mapping : C606.1				
Q.No	Questions	BT Level	Competence	PO
1	What is meant by Unconventional machining processes?	BTL-1	Remembering	PO1,PO6,PO12
2	What is the need of Unconventional machining processes?	BTL-1	Remembering	PO1,PO6,PO7
3	What are thermal energy methods of unconventional machining?	BTL-1	Remembering	PO1,PO7,PO12
4	What is electrical energy method of unconventional machining?	BTL-1	Remembering	PO1
5	What are electro-chemical energy methods of unconventional machining?	BTL-1	Remembering	PO1
6	List the mechanical energy methods of unconventional machining?	BTL-1	Remembering	PO1
7	Write the importance of surface finishing in machining operations	BTL-1	Remembering	PO1,PO12
8	What are the advantageous of unconventional machining process?	BTL-1	Remembering	PO1,PO6
9	Name the impotent factor that should be considered during the selections of unconventional machining process	BTL-1	Remembering	PO1
10	Classify the modern machining process on the basis of the type of energy employed	BTL-2	understanding	PO1
11	How will you compare various nontraditional processes?	BTL-1	Remembering	PO1
12	Why unconventional machining process is not	BTL-1	Remembering	PO1

	suitable for soft materials like aluminum?			
13	What are the characteristic of unconventional machining process?	BTL-1	Remembering	PO1,PO6,PO7
14	Compare conventional and unconventional machining process.	BTL-2	understanding	PO1
15	What is electro chemical energy method of UCM?	BTL-1	Remembering	PO1
16	What is chemical energy method of UCM?	BTL-1	Remembering	PO1
17	What is mechanical energy method of UCM?	BTL-1	Remembering	PO6
18	List the UCM process which uses mechanical energy	BTL-1	Remembering	PO1
19	Name the UN conventional machining process which are used to remove maximum materials	BTL-1	Remembering	PO1,PO6
20	Name the UN conventional machining process which are used to remove minimum materials	BTL-1	Remembering	PO1,PO7
21	Name the UN conventional machining process which are consume maximum power	BTL-1	Remembering	PO1,PO2
22	Name the UN conventional machining process which are consume minimum power	BTL-1	Remembering	PO1,PO12
23	Name the UN conventional machining process which produces best surface finish	BTL-1	Remembering	PO1,PO7,PO1 2
24	What type of energy source is applied in the Ion beam machining process?	BTL-1	Remembering	PO1,PO6
25	What type of energy source is applied in the electro chemical machining process?	BTL-1	Remembering	PO1
26	What type of energy source is applied in the chemical machining process?	BTL-1	Remembering	PO1,PO6
27	What type of energy source is applied in the electrical discharge machining process?	BTL-1	Remembering	PO1
28	What type of energy source is applied in the electron beam machining process?	BTL-1	Remembering	PO1
29	What type of energy source is applied in the AJM & LBM process?	BTL-1	Remembering	PO1
30	What type of machining used to produce the shallow holes?	BTL-1	Remembering	PO1
PART – B & C				
1	Explain the factors that should be considered during the selection of an appropriate unconventional machining process for a given job.	BTL-2	Understanding	PO1,PO6,PO7
2	Classify the unconventional machining process.	BTL-2	Understanding	PO1,PO6,PO7
3	How are the developments in the area of materials partly responsible for evolution of advanced material techniques?	BTL-1	Remembering	PO1,PO7,PO1 2
4	Write a note on recent development in unconventional machining techniques	BTL-2	Understanding	PO1,PO2,PO3
5	Compare the process capabilities and limitations of electrical energy based and mechanical energy based unconventional machining process.	BTL-2	Understanding	PO1,PO6
6	Explain the need for the development of unconventional machining process by considering any four simple cases of your own interest	BTL-2	Understanding	PO1,PO7

UNIT II MECHANICAL ENERGY BASED PROCESSES				
Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining – Ultrasonic Machining.(AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters – MRR- Applications				
PART – A				
CO Mapping : C606.2				
Q.No	Questions	BT Level	Competence	PO
1	What is the principle of USM?	BTL-1	Remembering	PO1
2	What are the applications of USM?	BTL-1	Remembering	PO1,PO6
3	What are the advantages of USM?	BTL-1	Remembering	PO1,PO7
4	Write the formula for MRR for ductile and brittle materials in AJM	BTL-1	Remembering	PO1
5	Write the operating principle of WJM	BTL-1	Remembering	PO1
6	What are the parameters influencing the MRR in USM process	BTL-1	Remembering	PO1
7	Show the effect of carrier gas pressure on MRR during AJM	BTL-2	Understanding	PO1,PO6
8	List out the abrasive materials used in ultrasonic machining process	BTL-1	Remembering	PO1
9	Why AJM process is not recommended for machining ductile materials?	BTL-1	Remembering	PO1
10	Explain the effect of stand off distance (SOD) in WJM process.	BTL-2	Understanding	PO1
11	List the process parameters of WJM process	BTL-1	Remembering	PO1,PO7
12	What is the cutting phenomenon in AJM?	BTL-1	Remembering	PO1
13	What are the components of USM?	BTL-1	Remembering	PO1,PO12
14	What type of machining performed in AJM?	BTL-1	Remembering	PO1
15	Mention the application of WJM	BTL-1	Remembering	PO1
16	What are the characteristics of a good suspension media of the USM process?	BTL-1	Remembering	PO1
17	Define AJM?	BTL-1	Remembering	PO1
18	How does AJM differ from conventional sand blasting process?	BTL-1	Remembering	PO1
19	What are the advantages of AJM process?	BTL-1	Remembering	PO1,PO6
20	What are the applications of AJM?	BTL-1	Remembering	PO1,PO6
21	Give a summary of the abrasive of their application for different operation?	BTL-1	Remembering	PO1,PO12
22	What are the disadvantages of using abrasives again and again?	BTL-1	Remembering	PO1,PO6
23	Reuse of abrasives is not recommended in AJM. Why?	BTL-1	Remembering	PO1,PO7
24	What are the advantages of WJC over conventional cutting methods?	BTL-1	Remembering	PO1,PO7
25	What are the commonly used additives in WJM?	BTL-1	Remembering	PO1,PO6
26	What is optical tracing system?	BTL-1	Remembering	PO1,PO6,PO7

27	Write short noted on piezoelectric crystals?	BTL-1	Remembering	PO1,PO2,PO3
28	What is magnetostrictive effect?	BTL-1	Remembering	PO1,PO6,PO7
29	What is abrasive Slurry?	BTL-1	Remembering	PO1
30	What is the functions of transducer?	BTL-1	Remembering	PO1

PART – B & C

1	Explain the principle of AJM. Mention some of the specific applications and limitations	BTL-2	understanding	PO1,PO6, PO3,PO7
2	Discuss in detail about the AJM process variables that influence the rate of material removal and accuracy in the machining	BTL-6	creating	PO1,PO6
3	(i) Explain the process parameters in WJM processes. (ii) With neat sketch explain the process of WJM. (iii) Briefly discuss the application and limitation of WJM	BTL-1	Remembering	PO1,PO6, PO3,PO7
4	(i) Explain the USM machine setup and discuss various feed mechanisms. (ii) Briefly discuss the mechanisms involved in material removal by USM. Derive the equation for volumetric material removal rate. (iii) Discuss the influence process parameters and applications of USM. Compare traditional abrasive machine and USM	BTL-1	Remembering	PO1,PO6, PO3,PO4
5	Give a note of the various types of transducers.	BTL-1	Remembering	PO1,PO12,
6	(i) Describe the principles, equipments, process capabilities, applications and advantages of Abrasive Flow Machining (AFM). (ii) Compare the types of nozzle designs employed in AWJM with neat sketches.	BTL-2	understanding	PO1,PO2, PO3,PO4

UNIT III ELECTRICAL ENERGY BASED PROCESSES

Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications.

PART – A

CO Mapping : C606.3

Q.No	Questions	BT Level	Competence	PO
1	State the principle of electrical discharge machining	BTL-1	Remembering	PO1
2	What are functions of dielectric fluid used in EDM?	BTL-1	Remembering	PO1
3	Basic requirement of dielectric fluid used in EDM?	BTL-1	Remembering	PO1,PO3
4	What the dielectric fluids commonly used in EDM?	BTL-1	Remembering	PO1,PO3
5	Name some of the tool material used in EDM?	BTL-1	Remembering	PO1,PO3
6	List out the applications of wire cut EDM process.	BTL-1	Remembering	PO1
7	What are the functions of adaptive control system used for EDM?	BTL-1	Remembering	PO1,PO3
8	Why the servo controlled system is needed in EDM?	BTL-1	Remembering	PO1,PO3
9	What are the feasible dielectric flushing techniques applicable in EDM process?	BTL-1	Remembering	PO1,PO3
10	What are the ways of gap flushing used in EDM?	BTL-1	Remembering	PO1,PO2

11	How to classify the EDM process based on power supply circuits.	BTL-1	Remembering	PO1,PO2
12	What is the working principle of wire –cut EDM process?	BTL-1	Remembering	PO1,PO6
13	What do you mean by recast layer with reference to the EDM?	BTL-1	Remembering	PO1,PO6,PO7,PO12
14	What is the difference between EDM and wire cut EDM?	BTL-1	Remembering	PO1,PO2,PO6
15	List out the limitations of EDM.	BTL-1	Remembering	PO1,PO2,PO12
16	List the applications of EDM	BTL-1	Remembering	PO1,PO2,PO12
17	List the recent development in EDM process.	BTL-1	Remembering	PO1,PO2,PO7
18	What is the process parameter efficiency the MRR?	BTL-1	Remembering	PO1,PO2,PO7
19	What are the prime requirements of tool material in EDM?	BTL-1	Remembering	PO1,PO2,PO7
20	What is the effect of capacitance in EDM?	BTL-1	Remembering	PO1,PO2,PO3
21	Write the formula for finding the energy discharge in EDM?	BTL-1	Remembering	PO1,PO12
22	How do you increase the inductance of the circuit?	BTL-1	Understanding	PO1,PO12
23	Define over cut?	BTL-1	Remembering	PO1,PO7
24	Define Rehardening?	BTL-1	Remembering	PO1,PO7
25	Explain electrode wear?	BTL-2	Understanding	PO1,PO6
26	What are the design factors to be considered while selecting the machine tool?	BTL-1	Remembering	PO1,PO6
27	Define wear ratio? What is recast metal?	BTL-1	Remembering	PO1,PO7
28	Define tool feed mechanism.	BTL-1	Remembering	PO1,PO6,PO7
29	Explain the requirement of dielectric fluid	BTL-2	Understanding	PO1,PO6,PO7
30	What is the function of servo mechanism in EDM process?	BTL-1	Remembering	PO1,PO2,PO7

PART – B & C

1	Explain the process of EDM, its process parameters and applications.	BTL-2	Understanding	PO1,PO2,PO6,PO3,PO4,PO7
2	Find the condition for maximum power delivery to the discharging circuit in EDM	BTL-2	Understanding	PO1,PO2,PO6
3	Explain the classification and characteristics of various spark erosion generators, flushing, electrode holders, and Dielectric. Explain EDM servo-system for automatic electrode reeled concept	BTL-2	Understanding	PO1,PO2,PO3,PO7
4	With help of neat sketch describe the mechanism of material removal in EDM.	BTL-2	Understanding	PO1,PO2,PO3,PO12
5	Describe the wire cut EDM equipment, its working, applications and advantages. Explain in detail about positioning system, wire drive system, power supply, dielectric system of wire cut EDM.	BTL-2	Understanding	PO1,PO2,PO3,PO12
6	Explain how the stratified wire works. Also discuss about the recent developments in wire EDM	BTL-2	Understanding	PO1,PO6,PO3,PO6

UNIT IV 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- equipments-Surface Roughness and MRR Electrical circuit-Process Parameters- ECG and ECH - Applications.

PART – A**CO Mapping : C606.4**

Q.No	Questions	BT Level	Competence	PO
1	What is mean by maskant?	BTL-1	Remembering	PO1,PO2
2	Mention the application of ECH	BTL-1	Remembering	PO1,PO6
3	What are the main functions of electrolysis in the ECM?	BTL-1	Remembering	PO1,PO2,PO7
4	What are the parameters that affect the MRR in ECG?	BTL-1	Remembering	PO1,PO2,PO6
5	State any four factors that affect the selection of etchant in chemical machining	BTL-2	Understanding	PO1,PO2,PO7
6	What are the maskants in CH process?	BTL-1	Remembering	PO1,PO7
7	Write the formula for finding MRR in ECM process	BTL-1	Remembering	PO1,PO2,PO7
8	Why there is no need to have short circuit protection device in ECG system?	BTL-1	Remembering	PO1,PO2,PO6
9	Name various parameters that influence the performance of CH process	BTL-1	Remembering	PO1
10	What is the difference between CH and ECH process?	BTL-1	Remembering	PO1,PO7
11	Why the life of ECG wheel is much higher than conventional grinding wheel?	BTL-1	Remembering	PO1,PO2,PO6
12	How does ECM differ from Electroplating?	BTL-1	Remembering	PO1,PO2,PO7
13	What are the advantageous of ECM process?	BTL-1	Remembering	PO1,PO2,PO6
14	What is self adjusting feature in ECM ?	BTL-1	Remembering	PO1,PO2,PO7
15	What do you understand by etch factor?	BTL-1	Remembering	PO1,PO2,PO6
16	State the limitations of ECM	BTL-1	Remembering	PO1,PO6
17	What are the characteristics of a good ECM tool?	BTL-1	Remembering	PO1,PO6
18	List the ECM electrolyte.	BTL-1	Remembering	PO1,PO6,PO7
19	What are the advantageous CH processes?	BTL-1	Remembering	PO1,PO2,PO7
20	State the functions of Electrolyte in ECM process	BTL-1	Remembering	PO1,PO2,PO6
21	What are the materials used to make the tool electrode?	BTL-1	Remembering	PO1,PO2,PO7
22	State the mechanism of ECM	BTL-1	Remembering	PO1,PO2,PO6
23	Write the working principle of ECM	BTL-1	Remembering	PO1,PO6
24	Write Ohm's law?	BTL-1	Remembering	PO1,PO6
25	What are the factors that influence oxidation in ECM?	BTL-1	Remembering	PO1,PO2,PO6
26	Which material is used to make the grinding wheel?	BTL-1	Remembering	PO1
27	What are the important functions of abrasive particles used in ECG?	BTL-1	Remembering	PO1,PO6
28	How the current density affect the MRR?	BTL-1	Remembering	PO1,PO6
29	What are the parameters that affect the MRR?	BTL-1	Remembering	PO1,PO6
30	What are the methods generally used to filter the electrolyte?	BTL-1	Remembering	PO1,PO6

PART – B & C				
1	Briefly discuss about the effect of high temp and pressure of electrolyte, process capabilities, tools, accuracy, surface finish, method of masking and chemistry involved on the ECM process.	BTL-6	Creating	PO1,PO6,PO6,PO7
2	Discuss about the economics of ECM. Compare EDM and ECM.	BTL-6	Creating	PO1,PO6,
3	Explain in detail the ECM process with neat sketch and also mention the advantages and applications.	BTL-2	Remembering	PO1,PO7,PO12
4	Describe the working principle and elements of chemical machining, chemical milling and chemical drilling. What are the factors on which the selection of a resist for use in chemical machining?	BTL-2	Understanding	PO1,PO6,PO7,PO12
5	What are the specific advantages of using chemical machining over electro chemical machining? Give some of the practical applications of chemical machining process	BTL-1	Remembering	PO1,PO6,PO7,PO12
6	(i) Explain the principle, advantages and applications of ECG. (ii) Discuss about the principles, equipments, accuracy, surface finish, process capabilities, applications, and advantages electrochemical honing and electrochemical grinding.	BTL-2	Understanding	PO1,PO6,PO7,PO12

UNIT V THERMAL ENERGY BASED PROCESSES				
Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.				
PART – A				
CO Mapping : C606.5				
Q.No	Questions	BT Level	Competence	PO
1	What is mean by Laser beam drilling?	BTL-1	Remembering	PO1,PO6
2	Compare LBM with EBM.	BTL-5	Evaluating	PO1,PO7
3	State any four process parameters in PAM.	BTL-1	Remembering	PO1,PO6
4	Write the advantageous of PAM	BTL-1	Remembering	PO1,PO7
5	Name the beam controlled techniques of EBM	BTL-1	Remembering	PO1,PO7
6	What is the principle of PAM process?	BTL-1	Remembering	PO1,PO7
7	What is the difference between transferred and non transferred type of plasma?	BTL-1	Remembering	PO1,PO7
8	Can you machine electrically non conductive materials by PAM ? Justify your answer	BTL-5	Evaluating	PO1,PO6
9	Why vacuum is needed in EBM process?	BTL-1	Remembering	PO1,PO6
10	Write the advantageous of LBM process.	BTL-1	Remembering	PO1,PO7
11	What is mean by population inversion between energy levels with respect to LBM?	BTL-1	Remembering	PO1,PO7
12	In PAM what are the two stages in which the process of materials removal is affected?	BTL-1	Remembering	PO1
13	What is the function of water muffler in PAM?	BTL-1	Remembering	PO1
14	Can you machine electrically non conducting	BTL-1	Remembering	PO1

	materials using EBM process?			
15	State the vacuum and non vacuum EBM process	BTL-1	Remembering	PO1
16	What are the characteristics of Laser beam?	BTL-1	Remembering	PO1
17	Describe the commonly used gas mixture and their corresponding work materials	BTL-2	Understanding	PO1
18	Why is the deflection coil provided for EBM?	BTL-1	Remembering	PO1,PO6
19	Write the disadvantages of EBM?	BTL-1	Remembering	PO1,PO7
20	What is Laser?	BTL-1	Remembering	PO1
21	What is the basic heating phenomenon that takes place in plasma arc welding?	BTL-1	Remembering	PO1,PO7
22	Write the principle of P.A.M	BTL-1	Remembering	PO1,PO7
23	Define EBM?	BTL-1	Remembering	PO1,PO6
24	Write the application of electron beam?	BTL-1	Remembering	PO1,PO7
25	What are the main elements of the EBM equipment?	BTL-1	Remembering	PO1,PO6
26	Write the advantage of EBM?	BTL-1	Remembering	PO1,PO6
27	Write the disadvantages of EBM?	BTL-1	Remembering	PO1
28	Write any four application of EBM?	BTL-1	Remembering	PO1
29	Write the Richardson-Dushman Equation.	BTL-1	Remembering	PO1,PO6
30	Write general formula for focal length of a magnetic lens?	BTL-1	Remembering	PO1,PO7
PART – B & C				
1	Explain the construction and working principle of LBM with neat sketch.	BTL-2	Understanding	PO1,PO6,PO7
2	List out the process capabilities, advantage and limitation of LBM process.	BTL-2	Understanding	PO1,PO6,PO7,PO12
3	Discuss in detail the thermal features and analysis of laser beam machining.	BTL-2	Understanding	PO1,PO6,PO7,PO12
4	(i) Explain the principle, advantages and limitation of PAM with sketch. (ii) Discuss the factors that influence the quality of the cut in PAM. (iii) Describe the applications and advantages of plasma in manufacturing industries.	BTL-2	Understanding	PO1,PO6,PO7
5	What is EBM? Sketch its set up and indicate its main parts and explain the principle of operation. Mention the application of EBM.	BTL-1	Remembering	PO1,PO6,PO7
6	(i) Explain the principles and elements of EBM, also how the work table is protected from getting damaged by electron beam. (ii) Discuss how the process variables influence MRR, HAZ and pattern generation.	BTL-2	Understanding	PO1,PO6 PO12

JEPPIAAR ENGINEERING COLLEGE

Department of Mechanical Engineering

ME 6004 - UNCONVENTIONAL MACHINING PROCESS - 2 MARKS

UNIT I INTRODUCTION

1. What is meant by Unconventional machining processes?

There is a need for machine tools and processes which can accurately and easily machine the most difficult-to-machine materials to intricate and accurate shapes. The machine tools should be easily adaptable for automation as well. In order to achieve these challenges, a number of newer material removal processes are introduced. These processes are called Unconventional machining processes.

2. What is the need of Unconventional machining processes? [April 2015](DEC-16&17)

- Sustain productivity with increasing strength of the work material
- Maintain productivity with desired shape, accuracy and surface integrity requirements
- Improve the capability of automation system and decreasing their sophistication requirements.

3. What are thermal energy methods of unconventional machining? [May 2013,2012]

- * Electron Beam Machining-EBM
- * Laser Beam Machining-LBM
- * Plasma Arc Machining-PAM

4. What is electrical energy method of unconventional machining?

- Electrical Discharge Machining-EDM
- Wire Cut EDM

5. What are electro-chemical energy methods of unconventional machining?

- Chemical Machining
- Electro-Chemical Machining (ECM)

6. List the mechanical energy methods of unconventional machining? [April 2010]

- * Abrasive Jet Machining-AJM
- * Water Jet Machining-WJM
- * Abrasive Water Jet Machining-AWJM
- * Ultrasonic Machining-USM

7. Write the importance of surface finishing in machining operations.[May 2014]

1. In the aerospace and medical fields the surface finish of machined components is of most importance
2. High pressure hydraulic systems and fuel injection system required high quality surface finish

8. What are the advantageous of UN conventional machining process? [May 2013]

1. It increase productivity
2. It reduces number of rejected components.
3. Close tolerance is possible

9. Name the impotent factor that should be considered during the selections of UN conventional machining process. [April 2011]

1. Physical parameters
2. Shapes to be machined
3. Process capabilities

4. Economic considerations

10. Classify the modern machining process on the basis of the type of energy employed.[April 2011](MAY-16)

1. Thermal energy method
2. Electrical energy method
3. Electro chemical energy method
4. Chemical energy method
5. Mechanical energy method

11. How will you compare various nontraditional processes?[Nov 2008]

1. Based on type of energy
2. Based on type of mechanism
3. Based on type of medium
4. Based on type of source of energy

12. Why unconventional machining process is not suitable for soft materials like aluminum? [April 2008]

Unconventional machining process is not so effective for soft materials like aluminum, because accuracy cannot be maintained due to more material removal rate.

13. What are the characteristic of unconventional machining process? [Nov 2007][DEC 17]

1. The tool material need not be harder than work piece materials
2. The machined surface does not have any residual stress.

14. Compare conventional and unconventional machining process. [April 2015][DEC 16]

Sl.no	Conventional	unconventional
1	Metal removal is done by means of traditional tool.	Metal removal is done by some form of energy
2	Here tool and materials are directly contact with each other	There is no physical contact between tool and materials
3.	Tool materials harder then work piece	No need of such conditions.

15. What is electro chemical energy method of UCM?

In this method, material is removed by ion displacement of the work piece material contact with a chemical solution.

16. What is chemical energy method of UCM?

In this method involved controlled etching of the workpiece material in contact with a chemical solution.

17. What is mechanical energy method of UCM?

In this method the material is removed by erosion of work piece of material.

18. List the UCM process which uses mechanical energy. [Dec 2004]

1. Ultrasonic machining
2. Abrasive jet machining
3. Water jet machining

19. Name the UN conventional machining process which are used to remove maximum materials.

1. Electro chemical machining
2. Plasma arc machining

20. Name the UN conventional machining process which are used to remove minimum materials

1. Electron beam machining
2. Electro chemical machining

21. Name the UN conventional machining process which are consume maximum power.

1. Laser beam machining

2. Ion beam machining
22. Name the UN conventional machining process which are consume minimum power.
Plasma arc machining
23. Name the UN conventional machining process which produces best surface finish.
 1. Abrasive jet machining
 2. Electro chemical machining
 3. Electro chemical grinding
 4. Electro chemical deburring
 5. Ultrasonic machining
24. What type of energy source is applied in the Ion beam machining process?
Ionised substance is a main energy source is applied in the Ion beam machining process.
25. What type of energy source is applied in the electro chemical machining process?
Electrical current is a main energy source is applied in the electro chemical machining process.
26. What type of energy source is applied in the chemical machining process?
Corrosive agent is a main energy source is applied in the chemical machining process.
27. What type of energy source is applied in the electrical discharge machining process?
Electrical current and mechanical motions are main energy source is applied in the electrical discharge machining process.
28. What type of energy source is applied in the electron beam machining process?
High speed electron is a main energy source is applied in the electron beam machining process.
29. What type of energy source is applied in the AJM & LBM process?
Mechanical and fluid motions, powerful radiations are the main energy source is applied in the AJM & LBM process.
30. What type of machining used to produce the shallow holes?
 1. Ultrasonic machining
 2. Electro discharge machining.

UNIT II - MECHANICAL ENERGY BASED PROCESSES

ABRASIVE JET MACHINING

1. What is the principle of USM? [May 2015]
Slurry of small abrasive particle is forced against the work piece by means of a vibrating particles tool and it causes the removal of metal from work piece in the form of extremely small chips.
2. What are the applications of USM? [May 2015]
 1. Almost all the material can be machined except some soft materials.
 2. Diamond, Tungsten, Tungsten carbide, and synthetic ruby can be successfully machined.
 3. USM can be used for drilling, grinding, profiling, coining, threading and even for welding.
 4. For preparing wire drawing dies and tool room items.
 5. Used in jewellery for shaping jewels
 6. Drilling of screw threads and curved holes in brittle materials
3. What are the advantages of USM? [May 2014]
 1. High accuracy and good surface finish
 2. No heat generation during machining
 3. Capability of drilling circular and non-circular holes in very hard materials.
 4. No thermal effects on mechanical work piece.
 5. Non-conductive materials can be machined.

4. Write the formula for MRR for ductile and brittle materials in AJM.[May 2014]

For ductile material $MRR = (MV^2/2EW)$

For brittle material $MRR = 1.04 (MV^{3/2} / \rho^{1/4} H^{3/4})$

Where M = mass flow rate

V = velocity

5. Write the operating principle of WJM. [May 2013]

When the high velocity of water jet comes from the nozzle and strikes the material its kinetic energy is converted into pressure energy including high stress in the work material. when this induced stress exceeds the ultimate shear stress of the material, small chips of the material get loosened and fresh surface is exposed.

6. What are the parameters influencing the MRR in USM process? [May 2013][MAY 16]

1. Grain size of abrasive
2. Abrasive material
3. Concentration of slurry
4. Amplitude of vibrations
5. Frequency of ultrasonic waves

7. Show the effect of carrier gas pressure on MRR during AJM. [May 2012]

MRR increases with increase in Gas or Air pressure.

8. List out the abrasive materials used in ultrasonic machining process.[May 2012]

1. Boron carbide
2. silicon carbide
3. aluminium oxide
4. Diamond

9. Why AJM process is not recommended for machining ductile materials? [April 2011][MAY 17]

AJM is not suitable for machining ductile materials, because there is always danger of abrasive particles getting embedded in the work piece.

10. Explain the effect of stand off distance (SOD) in WJM process.[April 2011]

If the sod is greater the depth of penetration is reduced. If the sod is smaller work piece is damaged by spatter.

11. List the process parameters of WJM process.[April 2010]

1. MRR
2. Geometry and surface finish of work material
3. Wear rate of materials.

12. What are the cutting phenomenon in AJM? [May 2009]

1. Mass flow rate
2. Abrasive grain size
3. Gas pressure
4. velocity of abrasive particle
5. Mixing ratio

13. What are the components of USM? [May 2009]

1. Ultrasonic transducer
2. Concentrator
3. Tool
4. Abrasive slurry
5. Abrasive feed mechanism

14. What type of machining performed in AJM? [Nov 2008]

1. For abrading and frosting glass, it is more economical than acid etching and grinding.
2. For doing hard suffuses safe removal of smears and ceramics oxides on metals.
3. Resistive coating etc from ports to delicate to withstand normal scrapping
4. Delicate cleaning such as removal of smudges from antique documents.
5. Machining semiconductors such as germanium etc.

15. Mention the application of WJM [April 2008][DEC 16]

- *Aero space
- *Automobile
- *Paper pulp industries

16. What are the characteristics of a good suspension media of the USM process? [April 2008]

1. Abrasive : B_4C , SIC and AL_2O_3
2. Abrasive slurry: Abrasive grains + water

17. Define AJM?

It is the material removal process where the material is removed or machined by the impact erosion of the high velocity stream of air or gas and abrasive mixture, which is focused on to the work piece.

18. How does AJM differ from conventional sand blasting process?

AJM differ from the conventional sand blasting process in the way that the abrasive is much finer and effective control over the process parameters and cutting. Used mainly to cut hard and brittle materials, which are thin and sensitive to heat.

19. What are the advantages of AJM process?

1. Low capital cost
2. Less vibration.
3. Good for difficult to reach area.
4. No heat is generated in work piece.
5. Ability to cut intricate holes of any hardness and brittleness in the material.
6. Ability to cut fragile, brittle hard and heat sensitive material without damage.

20. What are the applications of AJM?

1. For abrading and frosting glass, it is more economical than acid etching and grinding.
2. For doing hard suffuses, safe removal of smears and ceramics oxides on metals.
3. Resistive coating etc from ports to delicate to withstand normal scrapping
4. Delicate cleaning such as removal of smudges from antique documents.
5. Machining semiconductors such as germanium etc.

21. Give a summary of the abrasive of their application for different operation?

- (1) Aluminum Cleaning, Cutting and Debar
- (2) Silicon Carbide. Faster cleaning, Cutting. (3) Glass Heads Matt polishing, cleaning
- (4) Crushed glass Peening and cleaning.

22. What are the disadvantages of using abrasives again and again?

1. Cutting ability of the abrasives decreases after the large

2. Contamination of wears materials clogging the nozzle and the cutting unit orifices.

23. Reuse of abrasives is not recommended in AJM. Why? [MAY 16]

Reuse of abrasives is not recommended since the cutting ability of abrasive decrease after the usage and also the contamination of wear materials clogging the nozzle and the cutting unit orifice.

24. What are the advantages of WJC over conventional cutting methods?

- a. Because of point cutting WJC is able to cut materials almost any pattern.
- b. Material loss due to machining is minimum.
- c. WJC will not burn surfaces or produces a heat an affected zone.
- d. No environmental pollution.

25. What are the commonly used additives in WJM?

1. Crlycerine
2. Polyethylene oxide
3. Long chain polymers

26. What is optical tracing system?

It employs an optical scanner that traces a line drawing and produces electronic signals that control the X-rays

27. Write short noted on piezoelectric crystals?

Piezoelectric crystals are used foe inducing ultrasonic vibrations since they posses the capability of changing their dimensions to the given electrical energy or in other sense they have the capability converting electrical energy into mechanical vibrations.

28. What is magnetostrictive effect?

It is the one in which the material changes its dimension is in response to a magnetic field..

29. What is abrasive Slurry?

The abrasive slurry is nothing but a mixture of abrasive grains and the carrier fluid, generally water.

30. What is the functions of transducer? [Nov 2012]

Transducer is a device which converts one form of energy into another form of energy. In USM process it converts electrical energy into mechanical energy.

UNIT III - ELECTRICAL ENERGY BASED PROCESSES
ELECTRICAL DISCHARGE MACHINING

1. State the principle of electrical discharge machining. [May2015]
EDM is the controlled erosion of electrically conductive materials by the initiation of rapid and repetitive spark discharge between the electrode tool to the cathode and work to anode separated by a small gap kept in the path of dielectric medium. This process also called spark erosion.
2. What are functions of dielectric fluid used in EDM? [May2014][DEC 16]
 1. It acts as an insulating medium
 2. It cools the spark region and helps in keeping the tool and work piece cool.
 3. It maintains a constant resistance across the gap.
 4. It carries away the eroded metal particles.
3. Basic requirement of dielectric fluid used in EDM? [Nov 2012]
 1. Stable Dielectric strength.
 2. It should have optimum viscosity.
 3. It should have high flash point.
 4. It should be chemically stable at high temperature and neutral.
 5. It should not emit toxic vapors.
4. What the dielectric fluids commonly used in EDM? [Nov 2012][DEC 17]
 1. Petroleum based hydrocarbon fluids.
 2. Parafin, white sprite, transformer oil.
 3. Kerosine, mineral oil.
 4. Ethylene glycol and water miscible compounds.
5. Name some of the tool material used in EDM? [May2014, May2013]
 1. Copper, brass, alloys of Zinc & tin.
 2. Hardened plain carbon steel
 3. Copper tungsten, silver tungsten, tungsten
 4. Copper graphite and graphite.
6. List out the applications of wire cut EDM process. [May 2013][DEC 17]
Its best suited for the production of gears, tools, dies, rotors, turbine blades and cams for small to medium size productions.
7. What are the functions of adaptive control system used for EDM? [May 2012]
The main function of adaptive control system is to maintain a very small gap known as spark gap ranges from 0.005 to 0.05 mm between work piece and the tool.
8. Why the servo controlled system is needed in EDM? [April 2011, 2010]
EDM requires that a constant arc gap be maintained between the electrode and the work piece to obtain maximum machining efficiency. Therefore EDM tool incorporate some form of servo control.
9. What are the feasible dielectric flushing techniques applicable in EDM process? [April 2011]
 1. pressure flushing
 2. Suction flushing
 3. side flushing
10. What are the ways of gap flushing used in EDM? [May 2009]
 1. Time i.e., continuous or intermittent
 2. Flow i.e., pressure or injection flushing and vacuum.
11. How to classify the EDM process based on power supply circuits.[May2009]
 1. Resistance – capacitance circuit
 2. R-C-L circuit
 3. Rotary pulse generator circuit
 4. Controlled pulse generator circuit.

12. What is the working principle of wire –cut EDM process? [Nov 2008]

In wire cut EDM the metal is removed by producing powerful electric spark discharge between the tool and the work material. A very thin wire made of brass or molybdenum circular cross sections is used as a electrode.

13. What do you mean by recast layer with reference to the EDM? [April2008]

It is a surface integrity problem. Roughness is observed with in a bandwidth depending on single or multi spark conditions. In the experiment approach it is very difficult to predict these problems.

14. What is the difference between EDM and wire cut EDM? [Nov 2006]

Sl.no	EDM	Wire cut EDM
1.	Expensive alloy of silver and tungsten used as the tool	Very thin wire made molybdenum is used as a tool
2	It is easy to machine complex two dimensional profiles	It is difficult to cut complex two dimensional profiles.

15. List out the limitations of EDM. [May 2006][DEC 16]

1. it is suitable only small work piece
2. Electrode wears and over cut is major problem
3. MRR is low
4. Power requirement is high
5. Perfectly square corners cannot made by EDM process

16. List the applications of EDM. [May 2006]

1. Thread cutting in jobs
2. Drilling of micro holes
3. Helical profile drilling
4. Curved hole drilling
5. Production of complicated and irregular shaped profiles.

17. List the recent development in EDM process. [Nov 2005]

1. EDM process using impulse circuit instead of using relaxation circuit
2. Instead of using copper as electrode, harder tungsten copper is preferred.

18. What is the process parameter efficiency the MRR?

1. Energy discharge
2. Capacitance.
3. Size of work piece.
4. M/c tool design

19. What are the prime requirements of tool material in EDM?

- 1.It should be electrically conductive.
- 2.It should have good mach inability.
3. It should have low erosion rate.
4. It should have low electrical resistance.

20. What is the effect of capacitance in EDM?

Increasing the capacitance causes the discharge to increase and increase both the peak current and discharge time

21. Write the formula for finding the energy discharge in EDM?

$$W=(1/2) \times EIT$$

W-discharge energy, I-Current, T-time , E-voltage

22. How do you increase the inductance of the circuit?

A piece of iron or steel be allowed to lodge between the leads it would increase the inductance of the circuit and reduce the M/C rate.

23. Define over cut?

It is the discharge by which the machined hole in the work piece exceeds the electrode size and is determined by both the initiating voltage and the discharge energy.

24. Define Rehardening?

While metal heated to a temperature above the critical and then rapidly cooled by the flowing dielectric fluid the metal is rehardened.

25. Explain electrode wear?

A crater is produced in the electrode, which is likewise dependent on the electrode material and the energy of the discharge.

26. What are the design factors to be considered while selecting the machine tool?

1. Number of parts to be produced.
2. Accuracy.
3. Size of work piece.
4. Size of electrode
5. Depth of cavity.

27. Define wear ratio? ii What is recast metal?

Wear ratio=Work piece material removed/Loss of electrode material.

A crater is produced in the electrode, which is likewise dependent on the electrode material and the energy of the discharge.

28. Define tool feed mechanism.

It is defined as a mechanism which is control the feed rod and maintain the spark gap.

29. Explain the requirement of dielectric fluid.

It does not conduct the electricity

Must not be hazardous to operators

30. What is the function of servo mechanism in EDM process?

Control the feed rod and maintain the spark gap between tool and the work piece ranges from 0.005 to 0.05 mm.

UNIT IV - CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES

ELECTRO CHEMICAL MACHINING

1. What is mean by maskant? [April 2015] [JUNE-16]

In chemical machining process, the areas of the work piece which are not to be machined are covered with a resistant material, called a resist or maskant.

2. Mention the application of ECH. [April 2015]

1. Very precision of hard metals like tungsten carbide tooltips, high speed steel tools.
2. Cutting thin sections of hard materials without any damage or distortion.

3. What are the main functions of electrolysis in the ECM? [May 2014]

- i) For completing the electric circuit between the tool and the work piece and to allow the reaction to proceed efficiently.
- ii) To remove the products of machining from the cutting region.
- iii) To carry away the heat generated during the chemical reaction.
- iv) To avoid ion concentration at the work piece- tool gap.

4. What are the parameters that affect the MRR in ECG? [May 2014][DEC 16]

1. Current density
2. Electrolyte
3. Feed rate
4. Grinding wheel speed

5. State any four factors that affect the selection of etchant in chemical machining. [Nov 2012]

The chemical etchant depends upon the work materials.

1. Al- Caustic soda
2. Steel – HCL
3. Stainless steel – Iron chloride
4. MG – Nitric acid
5. Titanium – Nitric acid

6. What are the maskants in CH process? [May 2013]

1. Butyl rubber
2. Neoprene rubber
3. Polymers
4. Polyethylene.

7. Write the formula for finding MRR in ECM process. [May 2013]

$$MRR = EI / FAp$$

Where

E=weight

I = current

8. Why there is no need to have short circuit protection device in ECG system? [May 2012]

In ECG , the current flows through the electrolyte with positively charged ions and negatively charged ions. The positive ions moves towards the grinding wheel, while the negative ions move towards the work piece, it causes the removal of metal from work piece, so short circuit protection is not necessary.

9. Name various parameters that influence the performance of CH process. [May 2012]

1. Suitable etchant
2. Etch rate - 0.02 to 0.04 mm/ min
3. Depth of cut
4. Temperature of the solutions

10. What is the difference between CH and ECH process? [April 2011]

Sl.no	CH	ECH
1	The material is removed from the work piece through a controlled etching or chemical attack of the work piece	Material is removed by ion displacement of the work piece material in contact with the chemical solutions.

11. Why the life of ECG wheel is much higher than conventional grinding wheel? [April 2012]

The work is machined by the combined action of electro chemical effect and conventional grinding operations. The major portions of the metal is removed by electro chemical effect. So the life of ECG wheel is high.

12. How does ECM differ from Electroplating? [April 2010][JUNE-16]

1. in electroplating the primery interest is drawn towards the reaction taking place at the opposite electrods whereas in ECM the primary attentions is paid to the taking place to the anode of the cell.

2. in electroplating the main attentions paid to the depositions process, whereas ECM the anodic dissolutions process is most important.

13. What are the advantageous of ECM process? [Nov 2008]

- i. ECM is simple, fast and versatile method.
- ii. Surface finish can be extremely good.
- iii Fairly good tolerance can be obtained.

14. What is self adjusting feature in ECM ? [Nov 2012]

In steady state with a constant feed, the gap remains constant. Whatever initial gap is given it tends to the unit gap. In a constant feed rate ECM system the machining process is inherently self regulated since the metal removal rate tend to approach the feed rate.

15. What do you understand by etch factor? [April 2008][DEC 17]

The chemical machining proceeds on all exposed surfaces to the etching medium, under cuts are always associated with these processing operations. This undesired cutting known as etch factor.

16. State the limitations of ECM. [Nov 2007]

- i. Large power consumption and the related problems.
- ii. Sharp internal corners cannot be answered.
- iii. Maintenances of higher tolerances require complicated contours.

17. What are the characteristics of a good ECM tool? [Nov2007]

- (i) It should be a good conductor of electricity and heat.
- (ii) Easily machinable.
- (iii) Resistant to chemical reaction.
- (iv) It offers resistance to the high electrolyte pressure

18. List the ECM electrolyte . [May 2007]

1. 20% of NaCL solutions in water
2. mixture of brine and H₂SO₄
3. potassium salts and strong alkaline solutions.

19. What are the advantageous CH process? [May 2007]

1. Buffer free components
2. high surface finish
3. stress free components
4. tooling cost is low
5. Hard and brittle materials can be machined

20. State the functions of Electrolyte in ECM process. [Nov 2006][DEC 17]

1. it carries the current between the tool and work piece.
2. it cools the cutting zone
3. it remove the product of machining from cutting zone.

21. What are the materials used to make the tool electrode? [April 2005]

Copper and copper alloys, titanium, aluminum, brass, bronze, carbon, Monel and reinforced plastic.

22. State the mechanism of ECM .[Nov 2004]

It is the controlled removal of metals by the anodic dissolution in an electrolytic medium, where the work piece (anode) and the tool (cathode) are connected to the electrolytic circuit, which is kept, immersed in the electrolytic medium.

23. Write the working principle of ECM.[Nov 2004]

Faraday's first law of electrolysis:

The amount of any material dissolved or deposited is proportional to the quantity of electrolyte passed.

Second Law of Electrolysis:

The amount of different substances dissolved or deposited by the same quantity of electricity are proportional to their chemical equivalent weight.

24. Write Ohm's law?

$$\text{Current, } I = V/R$$

V = Voltage (volt), R = resistance (ohm)

25. What are the factors that influence oxidation in ECM?

- (i) Nature of work piece.
- (ii) Type of electrolyte.
- (iii) Current density.
- (iv) Temperature of the electrolyte.

26. Which material is used to make the grinding wheel?

Metal bonded diamond (or) Aluminum oxide.

27. What are the important functions of abrasive particles used in ECM?

It acts as insulator to maintain a small gap between the wheel and work piece. They are electrolysis products from the working area. To cut chips if the wheel should contact the work piece particularly in the event of power failure.

28. How the current density affect the MRR?

Current density is controlled not only by the amount of current but also by the size of the gap between the tool and the work piece. A small gap results in high current density, which in turn produce more material removal.

29. What are the parameters that affect the MRR?

(i) Feed rate. (ii) Voltage. (iii) Concentration of the electrolyte. (iv) Temperature of the electrolyte. (v) Current density. (vi) Velocity of the electrolyte.

30. What are the methods generally used to filter the electrolyte?

- (i) Running the system until it is contaminated completely and replace it.
- (ii) Centrifugal separation.
- (iii) Sedimentation.
- (iv) Use of clarifiers.

UNIT V - THERMAL ENERGY BASED PROCESSES **LASE BEAM MACHINING**

1. What is mean by Laser beam drilling? [April 2015]

The drilling of a given material is done by means of narrow and pulsed laser operating at 3 to 95 pulses per second. Due to high melting and vaporizing un wanted materials are removed from the work piece, that can make a hole it is called laser beam drilling.

2. Compare LBM with EBM. [May 2014]

Sl.no	LBM	EBM
1	Metal is removed by means of using high intensity of laser beam	Metal is removed by means of using high velocity beam of electrons
2	It is used to machine all materials except those having high thermal conductivity and high reflectivity.	It is used to machine all materials

3. State any four process parameters in PAM.[Nov 2012]

- 1. Type of gases
- 2. Cutting speed
- 3. Gas mixture

4. Write the advantageous of PAM. [May 2014]

1. Cutting rate is high
2. It is used for rough turning of very difficult materials
3. It can be used to cut any metal
4. Surface quality is high
5. Name the beam controlled techniques of EBM.[April 2015]
 1. Control of current
 2. Control of spot diameter
 3. Control of focal distance of magnetic lens

6. What is the principle of PAM process? [May 2014]

In PAM material is removed by directing high velocity jet of high temperature ionized gas on the work piece. This high temperature plasma jet melts the material on the work piece.

7. What is the difference between transferred and non transferred type of plasma?

Sl.no	Transferred plasma	Non transferred plasma
1	It is used to machine a conductive materials	It is used to machine non conductive materials
2	More electrical energy is transferred to work ,thus giving more heat to the work	Its giving less heat to the work

8. Can you machine electrically non conductive materials by PAM ? Justify your answer. [April 2011]

Yes. Indirect arc plasma torches can be used for machining electrically non conductive materials.

9. Why vacuum is needed in EBM process? [April 2011]

In order to avoid collision of accelerated electrons with air molecules vacuum is required.

10. Write the advantageous of LBM process.[April 2010]

1. Machining of non metal is possible
2. Micro sized holes can be machined
3. Soft materials like rubber and plastic can be machined
4. There is no tool wear.

11. What is mean by population inversion between energy levels with respect to LBM? [Nov 2008]

If the atoms in the excited state are greater than that of the ground state then it is known as population inversions.

12. In PAM what are the two stages in which the process of materials removal is affected? [Nov 2008]

1. Heating of the work piece by electron bombardment and by convective heat transfer from the plasma column.
2. Blasting the molten metal away by fluid dynamic forces.

13. What is the function of water muffler in PAM? [April 2008]

It is mainly used to cool the electrode and nozzle.

14. Can you machine electrically non conducting materials using EBM process? [April 2008]

All materials can be machined by using EBM process.

15. State the vacuum and non vacuum EBM process.[Nov 2007]

Vacuum EBM is costly, the recent development have made it possible to machine outside the vacuum chamber. In this system necessary vacuum is maintained within the electron gun and the gases are removed as soon as they enter in to the system.

16. What are the characteristics of Laser beam? [Nov 2006]

1. Material removal
2. Material shaping
3. Welding

17. Describe the commonly used gas mixture and their corresponding work materials. [May 2006]

1. Nitrogen- hydrogen – stainless steel
2. Argon- hydrogen- ferrous metal
3. Nitrogen – hydrogen composed air – carbon and alloy steel, cast iron.

18. Why is the deflection coil provided for EBM? [May 2005]

It is used to deflect the electron beam to different spot on the work piece. It can also used to control the path of cut.

19. Write the disadvantages of EBM? [Nov 2004]

- (i) High cost of equipment.
- (ii) Skilled operator is required for operation.
- (iii) Limited to 10mm material thickness.

20. What is Laser?

Laser can be melt diamond when focused by lens system. The energy density being of two order $100,000 \text{ KW/cm}^2$. This energy is due to atoms that have light energy level. When such an atom impinge with electromagnetic waves having resonant frequency.

21. What is the basic heating phenomenon that takes place in plasma arc welding?

The basic heating phenomenon that takes place at the work piece is a combination of anode heating due to direct electron bombardment recombination of molecules on the work piece.

22. Write the principle of P.A.M [JUNE 16]

Once the material has been raised to molten point the high velocity gas stream blows the material away.

23. Define EBM?

It is the thermo-electrical material removal process on which the material is removed by the high velocity electron beam emitted from the tungsten filament made to impinge on the work surface, where kinetic energy of the beam is transferred to the work piece material, producing intense heat, which makes the material to melt or vaporize it locally.

24. Write the application of electron beam?

- Thin film machining.
- Surface treatment.
- Engraving metals and non-metals.
- Cutting of materials.

25. What are the main elements of the EBM equipment?

1. Electron Gun.
2. Beam focusing and deflecting units.
3. Work Table.
4. Vacuum chamber

26. Write the advantage of EBM?

[DEC-16]

- (i) High accuracy.
- (ii) Any type of material can be processed.

- (iii) No mechanical or thermal distortion.
- (iv) No physical or metallurgical damage results.

27. Write the disadvantages of EBM?

- (i) High cost of equipment.
- (ii) Skilled operator is required for operation.
- (iii) Limited to 10mm material thickness.

28. Write any four application of EBM?

- (i) Micro machining application on materials.
- (ii) Drilling of apertures for electron microscope.
- (iii) Drilling of holes in ruby and diamond crystal.

29. Write the Richardson-Dushman Equation.

$$J = A t^2 e^{- (EW/KT)}$$

J = Current Density

A = constant (120 Amphere/cm²deg²)

K = Boltzman Constant (1.3x10⁻²³ J/K)

T = Absolute temperature (Kelvin)

W = work function (Volts)

30. Write general formula for focal length of a magnetic lens?

$$f/(S + D) = 25V/(NT)^2$$

V = Electron accelerating voltage

NT = Ampere turns in the lens winding

S = pole piece separation, D = Bore diameter

F = focal length

JEPPIAAR ENGINEERING COLLEGE

Department of Mechanical Engineering

ME 6004 - UNCONVENTIONAL MACHINING PROCESS - 16 MARKS

UNIT I - INTRODUCTION

1. Explain the factors that should be considered during the selection of an appropriate unconventional machining process for a given job. [May 2015, May 2014, Nov 2013]
2. Classify the unconventional machining process. [May 2015, May 2014, Nov 2013]
3. How are the developments in the area of materials partly responsible for evolution of advanced material techniques? [Nov 2013]
4. Write a note on recent development in unconventional machining techniques. [Nov 2013]
5. Compare the process capabilities and limitations of electrical energy based and mechanical energy based unconventional machining process. [May 2012]
6. Explain the need for the development of unconventional machining process by considering any four simple cases of your own interest. [April 2011].

UNIT II - MECHANICAL ENERGY BASED PROCESSES

1. Explain the principle of AJM. Mention some of the specific applications and limitations. [May 2015, May 2014, Nov 2013]
2. Discuss in detail about the AJM process variables that influence the rate of material removal and accuracy in the machining. [May 2015, Nov 2012]
3. (i) Explain the process parameters in WJM processes. [May 2014, Nov 2013]
(ii) With neat sketch explain the process of WJM. [Nov 2013]
(iii) Briefly discuss the application and limitation of WJM. [Nov 2013]
4. (i) Explain the USM machine setup and discuss various feed mechanisms. [May 2014, Nov 2012]
(ii) Briefly discuss the mechanisms involved in material removal by USM. Derive the equation for volumetric material removal rate [Nov 2013, Nov 2012]
(iii) Discuss the influence process parameters and applications of USM. Compare traditional abrasive machine and USM. [May 2014, Nov 2013]
5. Give a note of the various types of transducers. [Nov 2013]
6. (i) Describe the principles, equipments, process capabilities, applications and advantages of Abrasive Flow Machining (AFM). [Nov 2013]
(ii) Compare the types of nozzle designs employed in AWJM with neat sketches. [May 2015]

UNIT III - ELECTRICAL ENERGY BASED PROCESSES

1. Explain the process of EDM, its process parameters and applications. [May 2014]
2. Find the condition for maximum power delivery to the discharging circuit in EDM. [Nov 2013]
3. Explain the classification and characteristics of various spark erosion generators, flushing, electrode holders, and Dielectric. Explain EDM servo-system for automatic electrode refeed concept. [May 2015, May 2014, Nov 2013]
4. With help of neat sketch describe the mechanism of material removal in EDM. [Nov 2013, Nov 2012]
5. Describe the wire cut EDM equipment, its working, applications and advantages. Explain in detail

about positioning system, wire drive system, power supply, dielectric system of wire cut EDM. [May 2015, May 2014, Nov 2013]

6. Explain how the stratified wire works. Also discuss about the recent developments in wire EDM. [Nov 2012]

UNIT IV - CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES

1. Briefly discuss about the effect of high temp and pressure of electrolyte, process capabilities, tools, accuracy, surface finish, method of masking and chemistry involved on the ECM process. [May 2014, Nov 2013, Nov 2012]
2. Discuss about the economics of ECM. Compare EDM and ECM. [May 2014, Nov 2012]
3. Explain in detail the ECM process with neat sketch and also mention the advantages and applications. [May 2015, Nov 2013]
4. Describe the working principle and elements of chemical machining, chemical milling and chemical drilling. What are the factors on which the selection of a resist for use in chemical machining? [May 2015, Nov 2012]
5. What are the specific advantages of using chemical machining over electro chemical machining? Give some of the practical applications of chemical machining process. [Nov 2012]
6. (i) Explain the principle, advantages and applications of ECG. [May 2015, May 2014]
(ii) Discuss about the principles, equipments, accuracy, surface finish, process capabilities, applications, and advantages electrochemical honing and electrochemical grinding. [Nov 2013]

UNIT V - THERMAL ENERGY BASED PROCESSES

1. Explain the construction and working principle of LBM with neat sketch. [May 2015, May 2014, Nov 2013]
2. List out the process capabilities, advantage and limitation of LBM process. [May 2015, Nov 2013]
3. Discuss in detail the thermal features and analysis of laser beam machining. [Nov 2012]
4. (i) Explain the principle, advantages and limitation of PAM with sketch. [May 2015, Nov 2012]
(ii) Discuss the factors that influence the quality of the cut in PAM. [Nov 2012]
(iii) Describe the applications and advantages of plasma in manufacturing industries. [May 2014, Nov 2013]
5. What is EBM? Sketch its set up and indicate its main parts and explain the principle of operation. Mention the application of EBM. [May 2015, May 2014]
6. (i) Explain the principles and elements of EBM, also how the work table is protected from getting damaged by electron beam. [Nov 2012]
(ii) Discuss how the process variables influence MRR, HAZ and pattern generation. [Nov 2012]