

Noorul Islam College of Engineering
Department of Mechanical Engineering
Sixth Semester

UNIT I

1. What is meant by conventional machining processes?

In conventional machining processes, metal is removed by using some sort of the tool which is harder than the work piece and is subjected to wear. In this process, tool and work piece being in direct contact with each other.

2. What is meant by unconventional machining processes?

The Unconventional machining processes do not employ a conventional or traditional tool for metal removal; instead they directly utilize some form of energy for metal machining. In this process, there is no direct physical contact between the tool and the work piece.

3. What is the thermal energy method of Unconventional machining?

In these methods, heat energy is concentrated on a small area of the work piece to melt and vaporize the tiny bits of work material. The required shape is obtained by the continued repetition of this process. Example: LBM, PAM, EBM, IBM

4. What is electro chemical energy method of Unconventional machining?

In these methods, material is removed by ion displacement of the work piece material in contact with a chemical solution. Example: ECM, ECG, ECH, ECD

5. What is chemical energy method of Unconventional machining?

The chemical energy methods involve controlled etching of the work piece material in contact with a chemical solution. Example: CHM

6. What is a mechanical energy method of Unconventional machining?

In mechanical energy methods, the material is removed by mechanical erosion of the work piece material. Example: USM, AJM, WJM

7. List the unconventional machining process which uses mechanical energy?

1. Ultrasonic Machining (USM)
2. Abrasive Jet Machining (AJM)
3. Water Jet Machining (WJM)

8. List the unconventional machining process which uses thermal or heat energy?

1. Laser Beam Machining (LBM)
2. Plasma Arc Machining (PAM)
3. Electron Beam Machining (EBM)
4. Ion Beam Machining (IBM)

9. List the unconventional machining process which uses Electro chemical energy?

1. Electro Chemical Machining (ECM)
2. Electro Chemical Grinding (ECG)

3. Electro Chemical Honing (ECH)
4. Electro Chemical Deburring (ECD)

10. What are the characteristics of Unconventional machining process?

1. The Unconventional machining processes do not employ a conventional or traditional tool for metal removal; instead they directly utilize some form of energy for metal machinery.
2. The tool material need not be harder than the work piece material.
3. A harder and difficult to machine materials such as carbides, stainless steel, nitro alloy, hast alloy and many other high strength, temperature resistant alloys can be machined by unconventional machining processes.
4. The machined surface does not have any residual stresses.

11. Name the Unconventional machining processes which are used to remove maximum material?

1. Electro Chemical Machining (ECM)
2. Plasma Arc Machining (PAM)

12. Name the Unconventional machining process which is used to remove minimum material?

Electron Beam Machining (EBM)

13. Name the Unconventional machining process which consumes maximum power?

Laser Beam Machining (LBM)

14. Name the Unconventional machining process which consumes minimum power?

Plasma Arc Machining (PAM)

15. Name the Unconventional machining processes for machining following materials.

1. Non materials like ceramics, Plastics and glass.
 2. Refractories.
 3. Titanium.
 4. Super alloys.
 5. Steel.
1. Non materials like ceramics, Plastics and glass – USM, AJM, EBM, LBM
 2. Refractories – USM, AJM, EDM, EBM
 3. Titanium - EDM
 4. Super alloys – AJM, ECM, EDM, PAM
 5. Steel – ECM, CHM, EDM, PAM

16. What type of energy source is applied in Electrical Discharge Machining (EDM) process?

Electrical Spark.

17. What type of energy source is applied in Electron Beam Machining (EBM) process?

High speed electrons

18. What type of energy source is applied in Abrasive Jet Machining (AJM) process?
Mechanical and fluid motion

19. What type of energy source is applied in Laser Beam Machining (LBM) process ?
Powerful radiation

20. What are the advantages of Unconventional Machining Process (UCM)?

1. It increases productivity.
2. It reduces number of rejected components.
3. Close tolerance is possible.
4. The tool material need not be harder than work piece material as in conventional machining.
5. Harder and difficult to machine materials can be machined by this process.
6. The machined surface do not have any residual stresses.

Unit-II

ULTRA SONIC MACHINING

1. What is ultrasonic machining?

USM is a mechanical material removal process in which the material is removed by repetitive impact of abrasive particles carried in liquid medium on to the work surface, by a shaped tool, Vibrating at ultrasonic frequency.

2. What are the advantages of USM ?

Advantages

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.

3. What are the Disadvantages of USM?

- (1) Tool wear
- (2) Frequent turning is required
- (3) Low material removal rate.
- (4) Not economical for soft materials.

(5) Not suitable for heavy stock removal.

4. What are the applications of USM?

- (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.

5. What are the components of USM?

- (1) Ultrasonic transducer
- (2) Concentrator
- (3) Tool
- (4) Abrasive slurry
- (5) Abrasive feed mechanism
- (6) Tool feed mechanism

6. What is ultrasonic transducer?

The device used for converting any type of energy into ultrasonic waves or vibration is called ultrasonic transducer.

7. Write short notes on piezoelectric crystals?

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

8. What is magnetostrictive effect?

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

9. What are the magnetostrictive materials employed in USM?

Nickel, Iron – cobalt called as permendium, iron – aluminum called as alfer.

10. What is the purpose of concentrator used in USM?

The main purpose of the concentrator is to increase the amplitude of the vibration obtained from the transducer.

11. What is abrasive slurry?

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

12. What are the different types of concentrators?

- (1) Conical Type

- (2) Exponential type
 - (3) Stepped type.
13. What are the characteristics of carrier fluid?
- (1) Good wetting characteristic
 - (2) High thermal conductivity
 - (3) Non-toxic and non-corrosive.
 - (4) Should have low viscosity.
14. What are the elements of Carrier Fluid?
- (1) Act as a coolant.
 - (2) Act as an acoustic bond between the work piece and the tool.
 - (3) Helps efficient transfer of energy.
 - (4) Act as medium to carry the abrasive machined materials and worn abrasives
15. What are the types of feed mechanisms used in USM?
- (1) Spring type
 - (2) Counter – weight type
 - (3) Motor type
 - (4) Pneumatic and hydraulic type
16. What are the mechanisms used in USM metal removal?
- 1. hammering of abrasive particles in the work surface by the tool
 - 2. impact of free abrasive particles on the work surface
 - 3. cavitation erosion
 - 4. chemical action associated with the fluid employed
17. What are the major variables that controls the metal removal rate in USM?
- Tool oscillation, impact force, abrasive size
18. Write the disadvantages of amplifying type concentrators used in USM
- 1. Higher fabrication cost
 - 2. Poor surface finish quality
 - 3. Need for frequent tuning to maintain resonance
19. What is the purpose of horn used in USM?
- The horn should be fixed at a particular nodal point so that it makes the system rigid without loss in the mounting and we get the required amplitude of vibration
20. What are the functions of carrier fluid used in USM?
- 1. Acts as an acoustic bond between the work piece and the tool
 - 2. Acts as a coolant
 - 3. Helps efficient transfer of energy
 - 4. Acts as medium to carry the abrasive, machined materials and worn abrasives

ABRASIVE JET MACHINING

1. 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.

2. 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.

3. 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.

4. 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 surfaces, 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.

5. Write the Disadvantages of AJM process?

- (1) Low metal removal rate.
- (2) Due to stay cutting accuracy is affected.
- (3) Particles is imbedding in work piece.
- (4) Abrasive powder cannot be reused.

6. Give the formula for find the material remove rate for brittle metal?

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

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

<u>ABRASSIVE</u>	<u>APPLICATION</u>
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- | | |
|---------------|---------------------------------|
| (1) Aluminium | Cleaning, Cutting and Deburring |
|---------------|---------------------------------|

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

8. Write the formula to find the MRR for ductile materials?

$$\text{MRR} = 0.5 (MV^2 / H)$$

9. What are the Process parameters affecting the MRR in AJM?

- (1) Gas Pressure.
- (2) Velocity of Particles.
- (3) Abrasive mass flow rate.
- (4) Mixing ratio.
- (5) Nozzle Tip Distance.

10. 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.

11. What are the different types of nozzles heads used in AJM?

- (1) Right angle head.
- (2) Straight head.

12. Why oxygen should not be used in AJM?

Oxygen should not be used because of fire hazard problem.

13. What are the different types abrasives used in AJM?

Aluminium oxides, silicon carbides, Crushed glass, Sodium bicarbonate, Dolomite.

14. Reuse of abrasives is not recommended in AJM. why?

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.

15. What is Stand Off distance or Nozzle Tip Distance?

It is defined as the distance between the face of the nozzle and the working surface of the work piece material.

WATER JET MACHINING

1. What are the properties of water jet machining about effect cutting action?
High pressure, high velocity jet of water.
2. What are the types of units and its purpose used in water jet cutting system?
 - a. Pump -- to generate high pressure
 - b. Machining unit-- to actually cut the material with the jet nozzle.
 - c. Filtration unit -- to clear the water after use.
3. Why we are using the diamond nozzle.
 - a. High hardness metal
 - b. Working life is more compared to other jewel nozzle such as ruby or sapphire.
4. Why do you select proper cutting fluid in WJM?
Cutting fluids mainly depends on the operation requirement, quality of finish, cutting speed and overall cost
5. Does there is any environmental effects while using the water jet machining.
There is no environmental pollution such as dust suspended in the air because the water jet drains any dust simultaneously
When cutting.
6. 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.
7. What are the applications of WJM?
 - *Aero space
 - *Automobile
 - *Paper pulp industries
8. What are the commonly used additives in WJM?
 - 1.Crly cerine
 - 2.Polyethylene oxide
 - 3.Long chain polymers
9. What is optical tracing system?
It employs an optical scanner that traces a line drawing and produces electronic signals that control the X-rays.

UNIT-III

ELECTRICAL DISCHARGE MACHINING

1. Define electrical discharge machining?

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?

- 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?

- 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 vapours.

4. What the dielectric fluids commonly used in EDM?

- 1.Petroleum based hydrocarbon fluids.
- 2.Parafin, white sprite, transformer oil.
- 3.Kerosine, mineral oil.
- 4.Ethylene glycol and water miscible compounds.

5. 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.

6. Name some of the tool material used in EDM?

- 1.Copper, brass, alloys of Zinc & tin.
- 2.Hardend plain carbon steel
- 3.copper tungsten, silver tungsten, tungsten
- 4.Copper graphite and graphite.

7. What is the process parameter efficiency the MRR?

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

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

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

W-discharge energy

I-Current

T-time

E-voltage

9. 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.

10. 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.

11. Define W/T ratio?

It is the ratio of volume of work removed to the volume of tool removed.

12. What is cycle time?

It is the sum of discharge time and waiting time.

13. 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.

14. Define Rehardening?

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

15. What is recast metal?

Metal heated to a temperature above the melting point and which is not displaced by the action of the spark discharge, resolidifies as recast metal.

16. Explain electrode wear?

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

17. What are types of power supply circuits used in EDM?

1.R-Ccircuit.

2.Rotary impulse generator.

3.Controlled pulse (vacuum tube).

4.Oscillator controlled pulse.

5.Transister pulsed circuit.

18. 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.

19. Why the servo controlled system is needed in EDM?

EDM requires that a constant arc gap be maintained between the electrode and the work piece to obtain maximum machining efficiency. Therefore EDM tool in corporate some form of servo control.

20. Define wear ratio?

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

UNIT-IV

ELECTRO CHEMICAL MACHINING

1) Define ECM?

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.

2) Write the Faraday's first law of electrolysis?

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

3) Write the Faraday's 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.

4) Write Ohm's law?

$$\begin{aligned} \text{Current, } I &= V/R \\ V &= \text{Voltage} \\ R &= \text{resistance} \end{aligned}$$

5) 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.

- 6) What are the materials used to make the tool electrode?
Copper and copper alloys, titanium, aluminum, brass, bronze, carbon, Monel and reinforced plastic.
- 7) What are the main functions of electrolysis in the ECM?
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.
- 8) What are the properties are expected from the electrolysis used in the ECM?
i) High thermal conductivity.
ii) Low viscosity and high specific heat.
iii) Should be chemically stable even at high temperature.
iv) Should be non-toxic and non-corrosive.
- 9) What are the electrolysis commonly used in ECM?
15 -20 % NaCl in water, sodium nitrate, potassium nitrate, sodium sulphate, sodium chromate and potassium chloride.
- 10) What are the results which is in improper selection of electrolyte in ECM?
(i) Low machining rate. (ii) Over cut and stray cutting.
- 11) 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.
- 12) What are the characteristics of a good ECM tool?
(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.
- 13) What are the problems that occur while improperly selecting the electrolyte flow?
Cavitations, stagnation and vortex formation.
- 14) 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.
- 15) 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.

16) What are the advantages of ECM?

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

17) What are the limitations of ECM?

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

18) What are the applications of ECM?

ECM is used for sinking, profiling and contouring, multi hole drilling, trepanning, broaching, honing, steel mill applications, surfacing, sawing, contour machining of hand to hand machine materials.

ELECTRO CHEMICAL GRINDING

1. Define ECG.

ECG is the material removal process in which the material is removed by the combination of Electro- Chemical decomposition as in ECM process and abrasive due to grinding.

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

Metal bonded diamond (or) Aluminum oxide.

3. What are the important functions of abrasive particles used in ECG?

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.

4. What are the advantages of ECG?

- i) No thermal damage to work piece.
- ii) Wheel wear is negligible.
- iii) No distortion of the work piece.

5. What are the disadvantages of ECG?

High capital costs, because of the special wheel tool. Power consumption is quite high. Electrolyte is corrosive.

6. What are the limitations of ECG?

- 1.The work material must be conductive.
- 2.Nit suitable for machining soft material.
- 3.Require dressing tools for preparing the wheels.

7.What is the application of ECG?

- 1.Precision grinding of hand metals economically.
- 2.Grinding Carbide cutting tools inserts.
- 3.To grind end mill cutters more precisely.

Unit-V

LASER BEAM MACHINING

1.What is Laser?

It is acronym of light amplification by stimulated emission of radiation.

2.What is Maser?

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.

3.What are the characteristics of Laser beam?

- 1.Material removal
- 2.Material shaping
- 3.Welding
- 4.Thermo kinetic change.

4.What are the gases commonly used in LASER?

The gases commonly used are:
He, Ne, Argon, CO_2 etc.

5.What are the advantages of Laser drilling?

No physical contact between work root pair hence there is no possibility if breakage or wear of root. Precision location is ensured by focusing of the beam Large aspect ratio can be achieved.

6.What are the characteristics of Laser used in Laser machining?

1. Can be focused to maximum intensity or to lower intensity as needed.
2. Can be moved rapidly on the work.
3. Remote cutting over long standoff distances.

7.What are the fundamentals of photons used in Laser?

In the Laser the photons are in ground state at 0°C they are brought to the excited state by means of absorption of energy by temperature change, collision etc.

8. What are the emission lines?

The atoms when this they are bringing down goes to the excited state by stimulated emission and emit photons within 10 nano secs. They have the same wavelength as the excited photons.

9. What is the Maser principle?

The energy density of laser with $100,000 \text{ Kw/cm}^2$. The atoms at this state will impinge with electrons waves having resonate frequency. This is known as maser.

10. What is population inversion?

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

11. How does Laser melting works?

It melts and vaporizes the unwanted material by means of narrow pulsed laser operating at 2 to 100pulses/sec Because of this high accuracy is not possible to micro sized holes.

12. What is solid state Laser?

Solid state Laser is the Lasers, which consist of a hot nat, which may be crystalline solid/ glass, doped with an active material whose atoms provide the lasing action.

13. Write the properties of laser

monochromatic, coherence, divergence, intensity, mode structure

ELECTRON BEAM MACHINING

1) 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.

2) What is the characteristic of the electron beam?

- (i) High concentrated energy.
- (ii) Deep penetration into the metals.
- (iii) Low distortion.
- (iv) Any material either conductive or non-conductive can be processed.

3) Write the application of electron beam?

- Thin film machining.

- Surface treatment.
- Engraving metals and non-metals.
- Cutting of materials.

4) What are the main elements of the EBM equipment?

- (i) Electron Gun.
- (ii) Beam focusing and deflecting units.
- (iii) Work Table.
- (iv) Vacuum chamber

5) What is the function of magnetic lens used in EBM?

It converges the beam into a narrow spot into the work piece.

6) What are the two types of EBM?

- (i) Thermal type. (ii) Non-thermal Type.

7) Explain the thermal type EBM?

In this type the electron beam is used to heat the material up to the point where it is selectively vaporized.

8) Explain Non-thermal type EBM?

In this type, the EBM produces a chemical reaction.

9) Write the advantage of EBM?

(i) High accuracy. (ii) Any type of material can be processed. (iii) No mechanical or thermal distortion. (iv) No physical or metallurgical damage results.

10) Write the disadvantages of EBM?

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

11) 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.

12) Write the Richardson-Dushman Equation?

$$J = At^2 e^{-\frac{EW}{KT}}$$

J = Current Density

A = constant (120 Amphere/cm²deg²)

K = Boltzman Constant (1.3x10⁻²³ J/K)

T = Absolute temperature (Kelvin)

W = work function (Volts)

13) 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

14) Why vacuum is needed in EBM?

- 1) To reduce corrosion
- 2) To get correct focusing

15) What is the drawback of electron beam machining?

One major drawback of electron beam welding has been the requirement of high degree of vacuum essential for satisfactory operation of this process because of degassing.

PLASMA ARC MACHINING

1. Define plasma

Plasma is defined as the gas, which has been heated to a sufficiently high temperature to become ionized.

2. What are the advantages of plasma arc welding?

- a. Exothermic oxidation takes place.
- b. DC power supply

3. What are the metals that can't be machined by plasma arc machining?

- a. Stainless steel
- b. Monel
- c. Super alloys

4. 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.

5. How does the basic plasma is generated.

The basic plasma is generated by subjecting a stream of gas to the electron bombardment of the electric arc.

6. How the initial ionization is accomplished in plasma arc machining.

A high voltage arc established between electrode and nozzle accomplishes initial ionization.

7. Why does gas formed in plasma do in P.A.M?

This gas stabilizes the arc and prevents it from diverging.

8. How another source of heating achieved in P.A.M

It is desirable to achieve a third source of heating by injecting oxygen into work area to take advantage of exothermic oxidation.

9. Write the principle of P.A.M

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

10. Write the circuitry details in PAM.

+ ve terminal connected to work piece and -- ve terminal connected to electrode.

12. Which type of power supply is used in P.A.M

DC power supply is used.

13. Which part is constricted by plasma?

Nozzle duct is constricted by plasma.

Possible Part – B Questions

1. With the neat sketches discuss the working principle of main components of an Ultrasonic drilling machine (Ref. Nonconventional machining – P.K. Mishra page no:22)

2. Explain the functions of transducer and horns used in USM. List the tool materials used. (Ref. Nonconventional machining – P.K. Mishra page no:25,37& NTM- Weller page no: 18)

3. Briefly explain the effect of operating parameters on material removal rate. List the applications of USM.(NTMT – John Alexis , page no: 37 – 41)

4. Discuss the Abrasive slurry used in USM (NTMT – John Alexis , page no: 32)

5. Explain the Tool feed mechanism used in USM (NTMT – John Alexis, page no: 32)

6. How the unconventional machining processes are classified? (Ref. NCM – P.K. Mishra, Page no: 6)

7. How do the operating parameters affect the machining process in AJM process? Ref. (NTMT – John Alexis, page no: 7 - 12)

8. With the neat sketches discuss the working principle of main components of an AJM process and write the advantages and disadvantages of AJM. (NTMT – John Alexis, page no: 5 - 7)

9. Explain the Nozzle design and it's effect in AJM. (Ref. NTM- Weller page no: 41)

10. With the neat sketches discuss the working principle of main components of an AJM process and write the advantages and disadvantages of AJM. (NTM – Weller , page no: 144)
11. Discuss the following: i. Lasing process ii. Lasing materials(Ref. NCM – P.K. Mishra, Page no: 147 - 154)
12. Explain the types of Laser used in Laser beam machining. . (Ref. NTM- Weller page no: 141)
13. With the neat sketches discuss the working principle of main components of an AJM process and write the advantages and disadvantages of EBM. (Ref. NCM – P.K. Mishra, Page no: 161)
14. How do the operating parameters affect the machining process in EBM process? (Ref. NTMT – John Alexis, page no: 121 - 123)
15. What is the basic principle of Electro chemical machining process? (Ref. NCM – P.K. Mishra, Page no: 59)
16. Explain the Dynamics of ECM process. (Ref. NCM – P.K. Mishra, Page no: 65 - 71)
17. Discuss the Tool Design in ECM process. (Ref. NCM – P.K. Mishra, Page no: 71- 76)
18. How do the operating parameters affect the machining process in ECM process? (Ref. NTMT – John Alexis, page no: 79 - 81)
19. With the neat sketches discuss the working principle of main components of an ECM process and write the advantages and disadvantages of ECM. (NTMT – John Alexis, page no: 68 - 73)
20. With the neat sketches discuss the working principle of main components of an ECG process and write the advantages and disadvantages of ECG. (NTMT – John Alexis, page no: 84 - 88)
21. Explain the types of plasma arc torches (Plasmatron) used in PAM. (Ref. NCM – P.K. Mishra, Page no: 170 - 172)
22. How do the operating parameters affect the machining process in PAM process? (Ref. NCM – P.K. Mishra, Page no: 172 - 176)
23. With the neat sketches discuss the working principle of main components of an PAM process and write the advantages and disadvantages of PAM. (NTMT – John Alexis, page no: 126 - 128)
24. With the neat sketches discuss the working principle of main components of an WJM process and write the advantages and disadvantages of WJM. (Ref. NCM – P.K. Mishra, Page no: 45)
25. How do the operating parameters affect the machining process in WJM process? (Ref. NCM – P.K. Mishra, Page no: 47 - 52)
26. What are the metal removal concepts support the EDM process? (Ref. NCM – P.K. Mishra, Page no: 90 - 92)
27. Discuss the electrode tool materials used in EDM process. (Ref. NCM – P.K. Mishra, Page no: 94 - 102)
28. Discuss the power generators used in EDM process. (Ref. NCM – P.K. Mishra, Page no: 107 - 121)
29. Explain the flushing techniques used in EDM process. Discuss the electrode tool materials used in EDM process. (Ref. NCM – P.K. Mishra, Page no: 141 - 145)

30. How do the operating parameters affect the machining process in EDM process?
(NTMT – John Alexis, page no: 99 - 100)
31. With the neat sketches discuss the working principle of main components of an EDM process (Ref. NTM – Weller, Page no: 163)