MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)
(ISO/IEC - 27001 - 2005 Certified)

Summer 2016 EXAMINATIONS

Subject Code: **17542** **Model Answer**

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the answer scheme.

2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.

3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.

4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.

5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.

6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.

7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q1. A) Attempt any three:

a) List out four problems of traditional industries.
Ans :(Any four problems 1M each)

1. Human dependency

2. Mass production is not possible

3. Poor Quality of finished goods

4. Complex machining

5. Slow production

6. High amount of wastage

7. Product is less reliable

b) State magnetostriction effect.
Ans: (Statement 2 M)

Statement: the magnetostriction effect state that when the rod of the ferromagnetic material is placed into a magnetic field parallel to its length then its dimensions are changed.

(Explanation 2M)

Generally the change in the length is observed. The length may either increase or decrease. This change in the length is because of

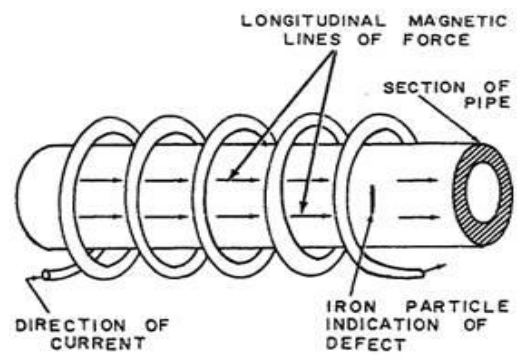
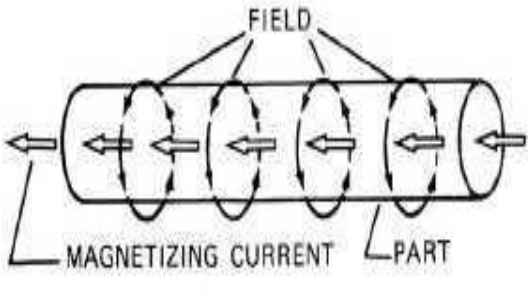
1. temperature
2. magnetization and
3. type of material used

The change is independent of the sign of the applied field. The magnitude of the change in the length is small but it is finite. Materials which exhibits this property are iron, nickel, steel, annealed copper

c) Compare longitudinal and Circular Magnetization(Any four points)

Ans: 4M

	Longitudinal magnetization	Circular magnetization
1.	In longitudinal magnetization current is passed through solenoid which is wound on workpiece.	In circular magnetization current is passed through workpiece.
2.	Magnetic flux lines are longitudinal in nature.	Magnetic flux lines are circular in nature.
3.	Longitudinal cracks are not detected but angular and transverse cracks are detected.	Longitudinal and angular cracks are detected but and transverse cracks are detected.
4.	Different sub-types of Longitudinal magnetization are:	Different sub-types of circular magnetization are:

	a) Coil-shot method b) Toroidal magnetization c) Yoke magnetization	d) Head-shot method e) Central-conductor Method f) Prod-magnetization
5.		

d) List any four types of heating techniques with one suitable application of each.

(Types of heating 1/2 mark each)

Heating Techniques:

1. Induction Heating
2. Dielectric Heating
3. Microwave Heating
4. Infrared Heating

(any one Application of each heating 1/2 mark)

1. Induction Heating:
   a. Surface hardening of steel
   b. Annealing
   c. Soldering
   d. Brazing

2. Dielectric Heating
   a. Gluing, curing and Drying of wood
   b. Preheating plastic perform to condition them for molding.

3. Microwave Heating
   a. Microwave ovens
   b. Food processing

4. Infrared Heating
   a. Drying fresh layer of paint.

b. Painkiller in medical therapy.

B) Attempt any one: **6 Marks**

a)Draw and explain the basic set up of EDM.

(Set up diagram 3Marks)

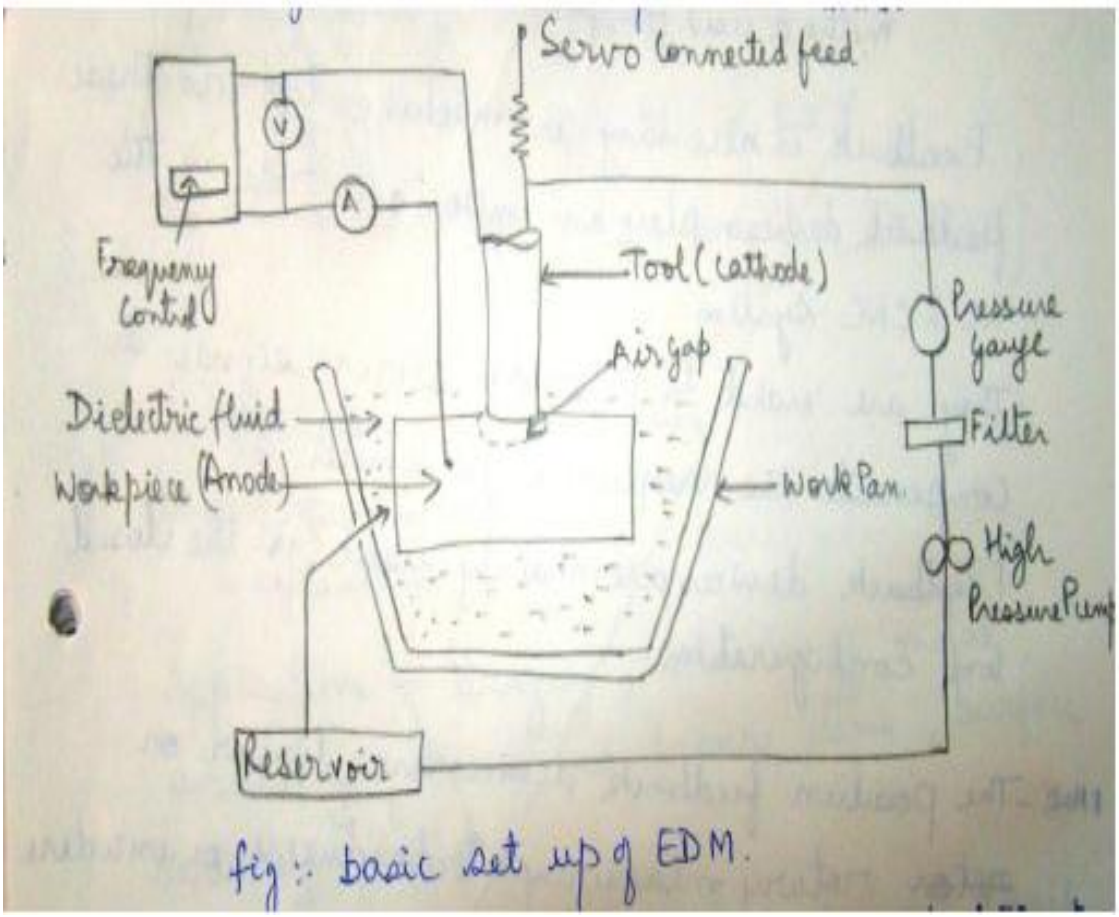


fig :- basic set up of EDM.

(Explanation 3M)

Explanation: EDM process involved a controlled erosion of electrically conducting, material by the initialization of rapid and repetitive spark discharge between the electrode (tool)usually a cathode and work piece (anode) separated by a small gap of about 0.01 to 0.5 mm known as spark gap. This spark gap is either flooded or immersed under the dielectric fluid. The spark discharge is produced by the controlled pulsating direct current between work piece and tool. The dielectric fluid in spark gap is ionized under the pulsed application of the direct current, thus enabling the spark discharge to pass between the tool and the work piece Each spark produces enough heat to melt and vaporized a tiny volume of the work piece material leaving a small crater on its surface. The energy contained in each sparks is discrete and it can be controlled so that material removal rate, surface finish and tolerance can be predicted.

OR

1.Electric current applied to 0.5 to 4.00 amperes range at 40 – 300Vd.c. with pulse duration of 2 to 2000 μsec
2. Dielectric fluid is pumped through the tool on workpiece at a pressure of 2 kg/cm2
3. Electric pulse should not exceed 0.001 second because it can cause arcs.
4. Electrically conductive materials can be used for machining.
5. Fluids used are hydrocarbon oils, distilled on deionized water.
6. Dielectric fluids by ionizing provides path for current to discharge or spark when sufficient voltage is applied.
7. The size of crater is dependent on the size of the discharge or spark.
8. Energy of the discharge, W = ½ * voltage* current * time.

b) List the applications of dielectric heating and explain any one. State the advantages of dielectric heating.

Ans:

(Applications 2 M.)

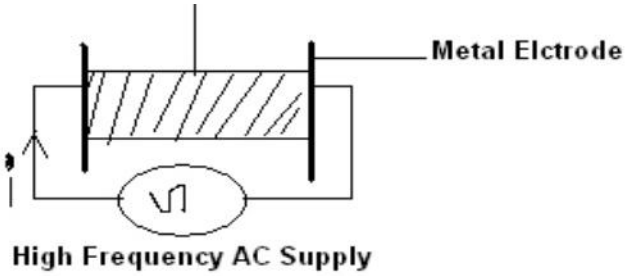
a. Gluing, curing and Drying of wood
b. Preheating plastic perform to condition them for molding.
c. Plastic sewing.
d. Drying and heat treatment of nature and synthetic rubber, rayon, nylon etc.
e. Processing of chemicals during manufacture.
f. Curing of sand cores in foundries.
g. Sterilization of medical supplies.
h. Food processing

Note: (Any other application can be considered.)

Explanation: 3 Marks, diagram-optional

Preheating of Plastic Performs: If heated by traditional way plastic surface becomes hard until the inner layers receive heat. Thus it is the required to heat the plastic uniformly throughout the material.

Plastic perform



The thermosetting plastics should be heated to a particular temperature for hardening or setting. This process is called as curing.

Plastic perform is the raw plastic in the form of tablets or biscuits. It is first put in hot mold. These performs are heated uniformly throughout the mass to the desired temperature by means of dielectric heating.

(Any Two advantages 1 mark)

Advantages of Dielectric Heating

1. Uniform heat throughout the job
2. Heat control is possible
3. No by products
4. Neat and clean process
5. No gases or ash is produced
6. High rate of heating

Q2. Attempt any four:

a) List advantages of modern industry over traditional industry.

Ans:

(Any four 1M. each)

i)Better working conditions are available.
ii) Production rate is increased.
iii)Overall production cost is reduced.
iv)Quality and reliability of product is higher.
v)Component procedureisuniform.
vi)Human fatigue is reduced.
vii) Automatic control process.

b) What is NDT? List the different methods of NDT.

Ans:

(2M)

Nondestructive testing (NDT) is the process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities, or differences in characteristics without destroying the serviceability of the part or system. In other words, when the inspection or test is completed the part can still be used.

OR

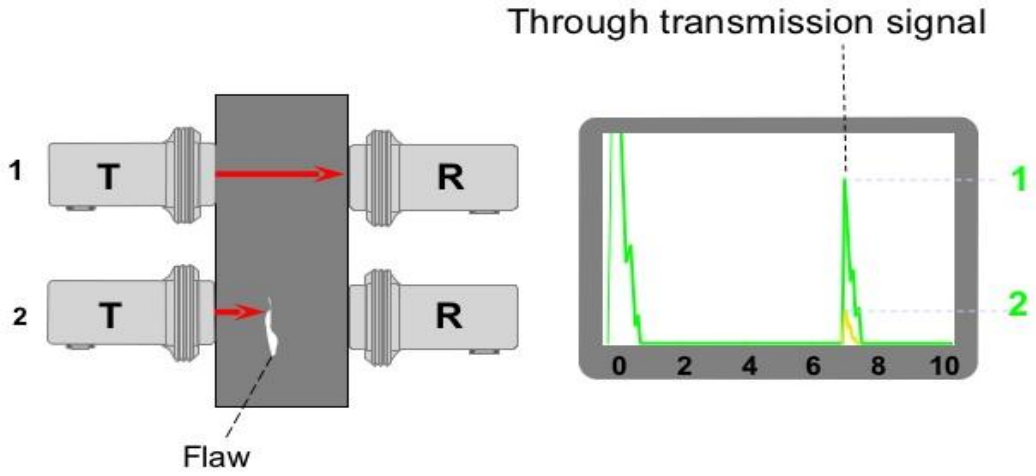
NDT detects flaws and non-homogeneities in the material without destroying or disturbing the properties of material i.e. size, shape, chemical composition, gradual structure etc.

Any four types 2 Marks

1. Visual inspection
2. Ultrasonic Testing
3. Magnetic Particle Testing
4. Radiography
5. Liquid Penetrant
6. Eddy current Testing
7. Thermal testing
8. Acoustic emission testing

c) Explain through transmission method of Ultrasonic flaw detection with appropriate diagram.

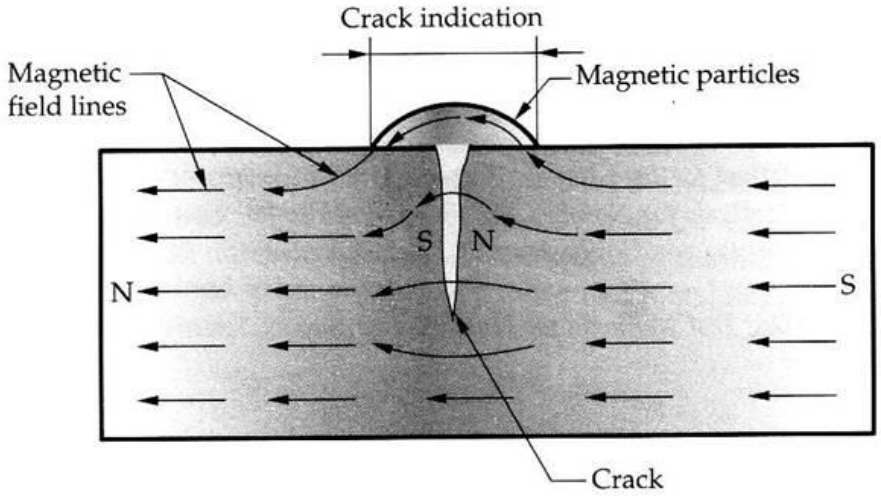
Ans: Diagram:2 Marks, Explanation:2Marks



The Ultrasonic waves are transmitted through the test piece and received from other side of test piece. So the method is called **through transmission.**
If no defect certain strength of the signal will reach the receiver.
If a defect a present in the test piece then there will be proportional reduction in strength of the received signal because of partial reflection of pulse. Thus presence of defect is detected.
But number of flaws, location and size of defect cannot be identified.

d) Describe the principle of magnetic particle testing.

(Diagram 2M)

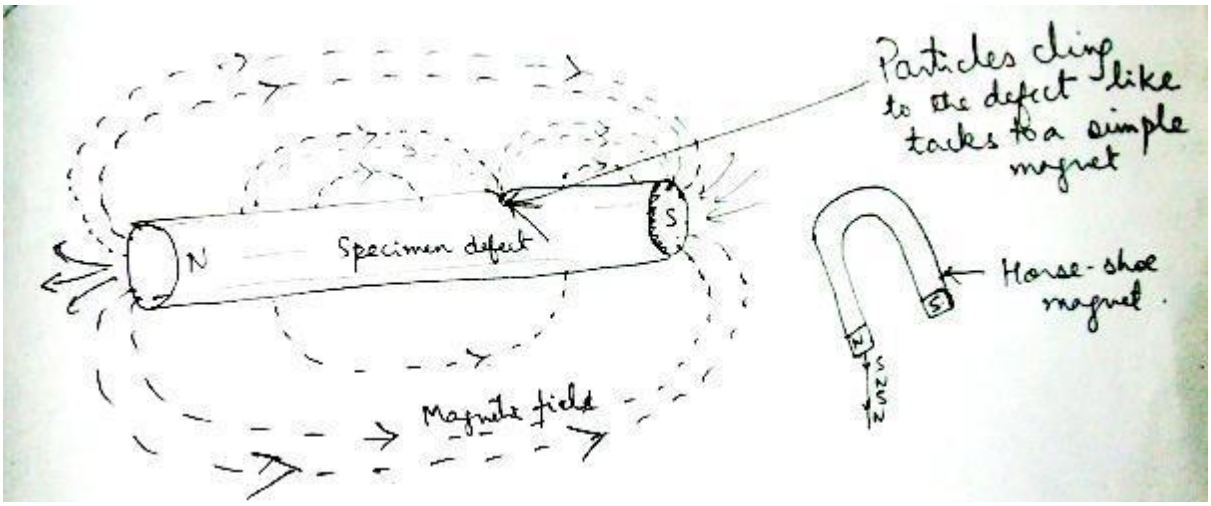


Explanation:2Marks

Magnetic particle Inspection (MPI) is a non-destructive testing (NDT) process for detecting surface and slightly subsurface discontinuities in ferromagnetic materialsuch as iron, nickel, cobalt, and some of their alloys. The process puts a magnetic field into the part. The piece can be magnetized by direct or indirect magnetization. Direct magnetization occurs when the electric current is passed through the test object and a magnetic field is formed in the material. Indirect magnetization occurs when no electric current is passed through the test object, but a magnetic field is applied from an outside source.

The magnetic lines of force are perpendicular to the direction of the electric current which may be either alternating current (AC) or some form of direct current (DC) (rectified AC).The flaws which are perpendicular to the flux can only be detected.

OR



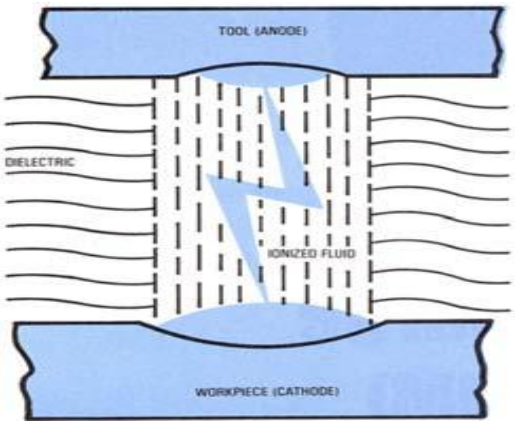
Principle of magnetic crack detection: when a ferromagnetic material is magnetized any magnetic discontinuities that lie in the direction approximately perpendicular to the applied field direction will result in the formation of leakage field. This resulted leakage field is present on the surface of the material which is detected visibly by use of magnetic particles

e) State the principle of EDM with the help of schematic diagram.

(Principle 2M)

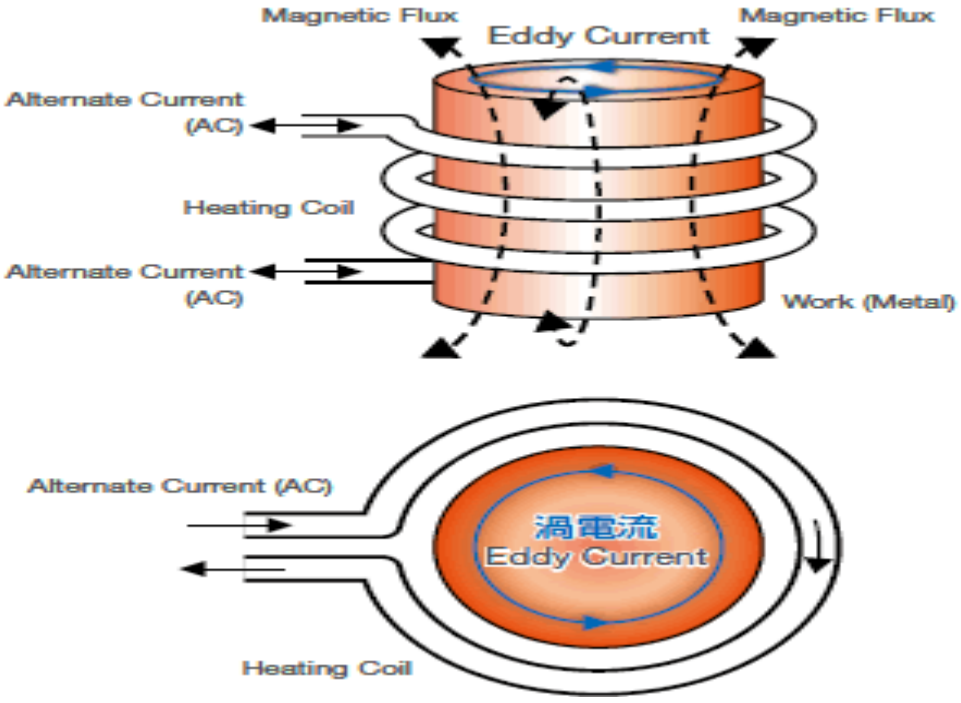
Principles of EDM Electrical Discharge Machining (EDM) are a controlled metal-removal process that is used to remove metal by means of electric spark erosion. In this process an electric spark is used as the cutting tool to cut (erode) the workpiece to produce the finished part to the desired shape. The metal-removal process is performed by applying a pulsating (ON/OFF) electrical charge of high-frequency current through the electrode to the workpiece. This removes (erodes) very tiny pieces of metal from the workpiece at a controlled rate.

(Labeled Diagram 2M)



f) State and describe principle of induction heating.

(Diagram 2M,Explanation: 2Marks)



When a metal object to be heated is wound by a coil, which is called as work coil through which alternating current is passed, AC magnetic field is produced in the metal object

The emf induced by magnetic flux ‘e’ is given by

$$e=-d\emptyset/dt$$

Due to induced voltage 'e' AC eddy current flows through metal object in circular path at right angle to the flux. This eddy current results in power dissipation in the resistance, thus generating maximum heat at the surface

OR

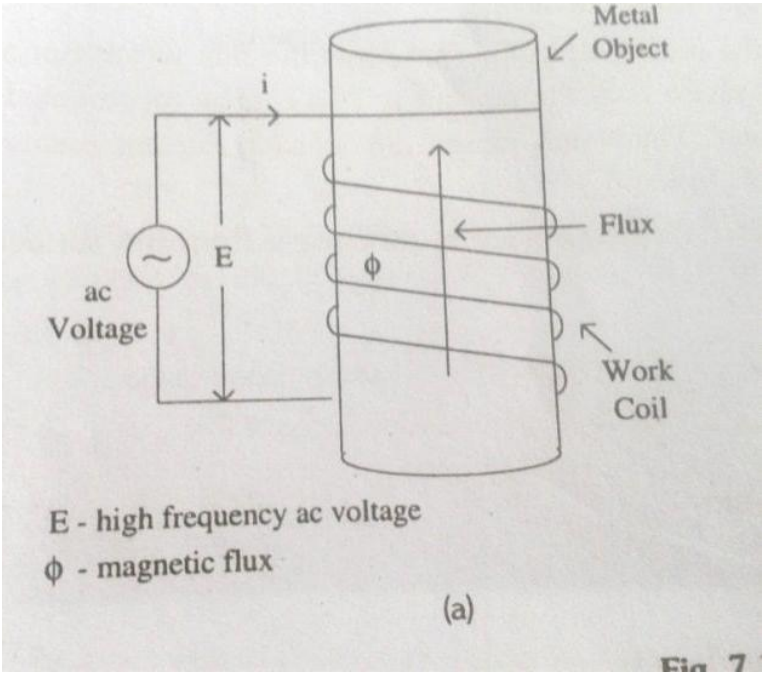


Fig. 7

1. The metal object to be heated is wound by a coil, which is called as work coil through which alternating current is passed by applying ac voltage.

2. Here the work coil acts as primary winding and the metal object acts as short circuited secondary winding.

3. Due to alternating current flowing through the coil, AC magnetic field is produced in the metal object

4. Due to induced voltage ac eddy currents flow through the metal object, results in power dissipation at the secondary winding.

5. Thus eddy currents are produced through inductance and the heating method is called as induction heating.

Q3. Attempt any four: **16 marks**

a) Write causes of accidents.

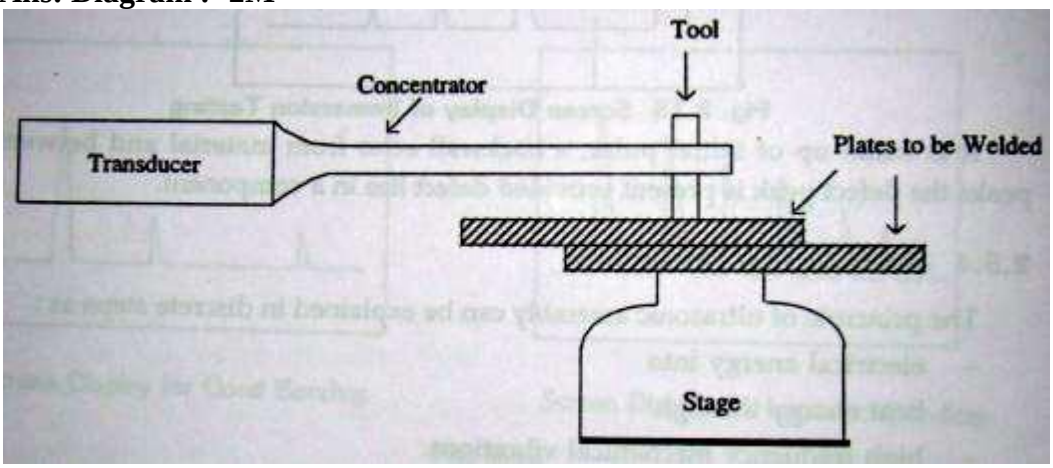
Ans: (related points should also be considered)
Causes: Any four- 1 M each

1. Taking shortcuts
2. Being over confident
3. Poor house-keeping (slippery floors etc.)
4. Ignoring safety procedures
5. Failure to preplan the work
6. Driver error
7. Touching any live wire or exposed metal parts.

8. Tools or equipment's not in good condition
9. Inexperience at work
10. Consumption of alcohol, drug, etc.
11. Not following the instruction manuals of the machine, equipment's or plant.

b) Describe the process of cold welding using ultrasonic.

Ans: Diagram :- 2M

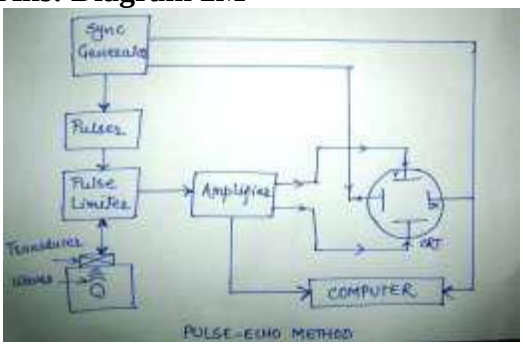


Explanation: 02M

The properties of some metals change on heating and therefore, such metals cannot be welded by electric or gas welding.
In such cases, the metallic sheets are welded together at room temperature by using ultrasonic waves.
For this purpose, a hammer H is attached to a powerful ultrasonic generator as shown in Figure.
The metallic sheets to be welded are put together under the tip of hammer H.
The hammer is made to vibrate ultrasonically. As a result, it presses the two metal sheets very rapidly and the molecules of one metal diffuse into the molecules of the other.
Thus, the two sheets get welded without heating. This process is known as cold welding**.**

c)Describe the pulse echo method of ultrasonic flaw detection with the help of neat block diagram..

Ans: Diagram 2M



Explanation 02M

- The above fig. shows schematic block diagram of pulse echo ultrasonic flaw detector.
- Here, **transducer** is kept in contact with workplace. Initially the transducer work as transmitter and gives outultrasonic wave of desired frequency
- **Sync generator**:-This block generates synchronization signal for pulsar CRT displays and computer.
- **Pulser**:-it is used to generate designed frequency.

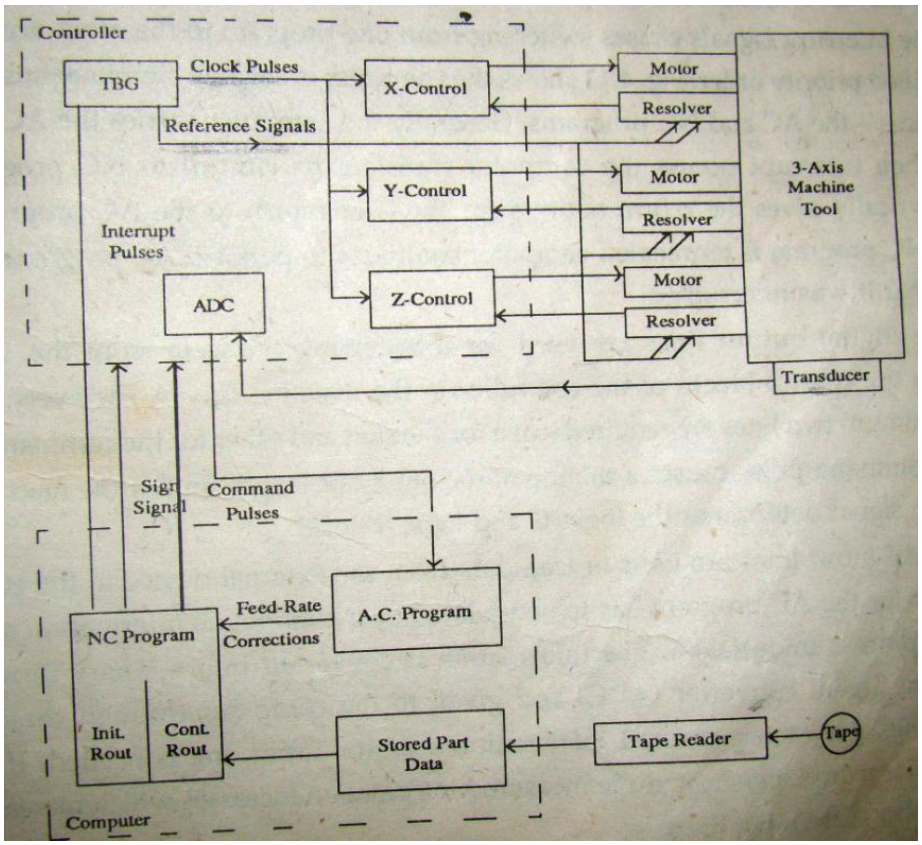
- **Pulse limiter :-**it is used to control amplitude of ultrasonic wave generated .
- **Amplifier**:-it receives the reflected wave and amplifies to drive the display.
- **Display: -**CRT display is used for displaying transmitted pulse which give portion of flaw in work place.
- **Computer**: -it can be integral part of flaw detector which will allow user to start number of set of results for layereducation and analysis.

d)Explain the need of demagnetization in magnetic crack detection.

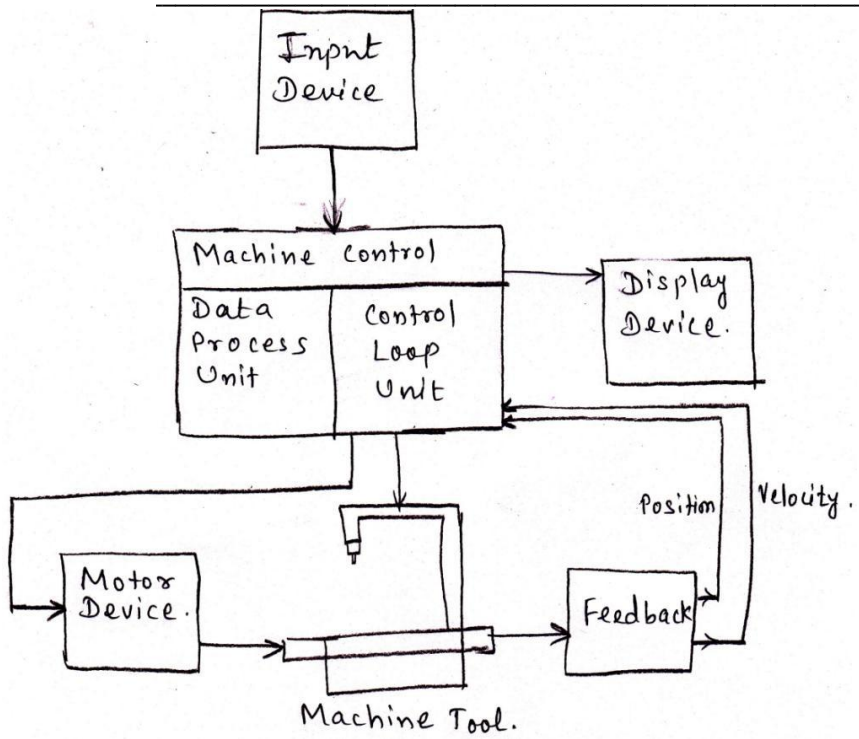
Ans:- (any four Points) 1M each
Demagnetization is required for following reasons.
1. Residual fields will affect the magnetic compass or create problems with delicate instruments.
2. Residual fields in rotating parts will attract metal particles, causing excessive wear.
3. Magnetic particles can be removed for further wear.
4. Particles could adhere to magnetized surface and interfere with subsequent operations such as painting or electroplating.
5. If a magnetized part is machined, chips could adhere to the surface being machined and adversely affect the surface finish, dimensions and tool life.
6. Residual fields can cause 'Air Blow' which defects the molten metal during welding operations.

e) Draw and explain the block diagram of CNC machine.

Ans: Block diagram:2M



OR



Explanation - 2 mks

1. Machine tool with DC servo motor as feedback element. The transducer is added as adaptive control application.
2. The auxiliary controller through which the computer can control the machine drives. It is made up of Time Base Generator (TBG) and Analog to Digital Converter (ADC).
3. The computer for storing the data and performing the NC and AC (Adaptive control) programs. Interrupt system takes care of simultaneous running of both programs.
4. Tape reader for reading the two programs and NC data tapes.

The TBG includes the main clock having pulse frequency of 2.5 MHz. It is used for three functions direct feeding of the control loops, generating interrupt pulses and generating reference signal for stator and revolvers.The controller is connected to the computer with three different lines namely: Interrupt input line,Digital output line and Digital input line. The interrupt pulses are generated by TBG and supplied to computer through interrupt line.

Q4. A) Attempt any three: 12 marks

a) List any four features of modern industry.

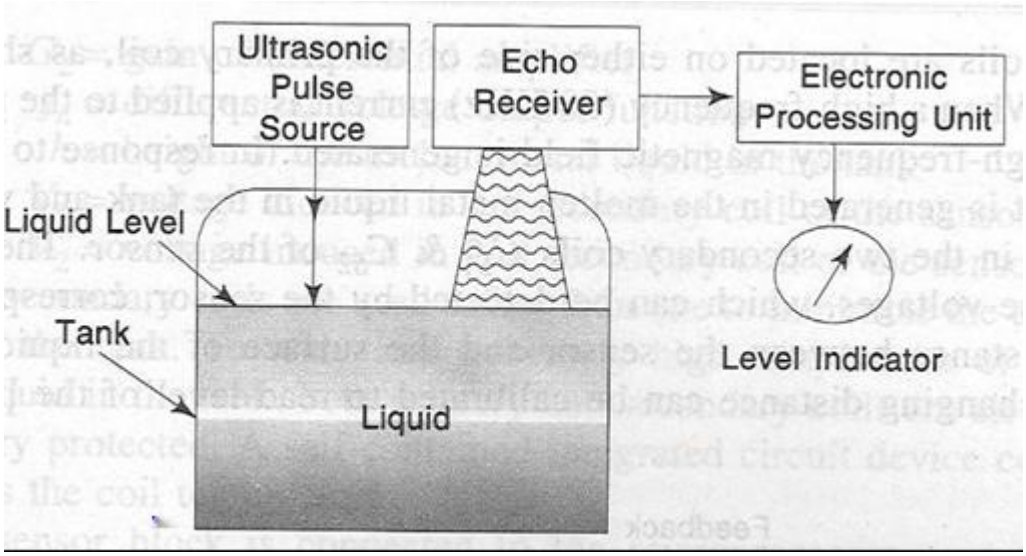
Ans: (any 4 points):1M each

i) Better working conditions .
ii) Increase in production rate.
iii) Less overall production cost .
iv) Quality and reliability of product is higher.
v) Component procedure is uniform.
vi) Human fatigue is reduced .
vii) Automatically operated machines like NC/CNC are used for mass productions.
viii) In modern industry nondestructive techniques such as ultrasonic testing and magnetic particle testing are used. Because of which internal structure of material will not be affected.
ix). New machine in techniques such as EDM is used to improve accuracy and quality of the product.

x). For controlled heating different heating techniques like Induction heating and Dielectric heating are used.

b) Explain ultrasonic level measurement.

Ans: Diagram:2marks



Explanation: 2marks

- Ultrasonic level detectors operate either by the absorption of acoustic energy as it travels from source to receiver. It operates by generating an ultrasonic pulse and measuring the time it takes for the eco to return. Figure illustrates the working of an ultrasonic level detector.
- Ultrasonic level detectors consist of a set of transmitter and receiver.
- It is connected to electronic processing unit which calculates the time taken by ultrasonic wave to travel from Transmitter to receive.
- Level Indicator is used to display liquid level.
- The ultrasonic wave generated by transmitter is directed towards the liquid surface.
- These waves get reflected by liquid surface and received by the receiver.
- The time taken by the wave is a measure of the distance travelled by the wave.

$$T \alpha h' \alpha (H-h)$$

Where t= time between transmitting and receiving pluses, H=distance between ultrasonic set and the bottom of the tank, h=distance between the ultrasonic set and surface of the contents in tank.

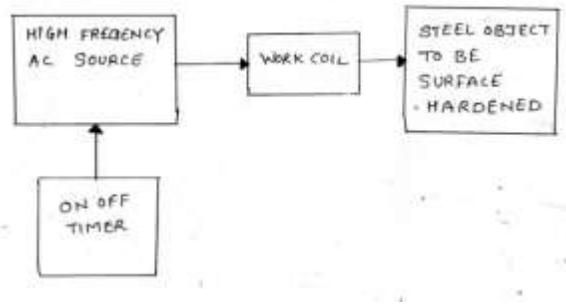
c)State four properties of dielectric fluid used in EDM.

Ans: Any 4 points- 4M
Properties of dielectric fluid:
1. The Dielectric fluid should have sufficient and stable dielectric strength to serve as insulation between electrode and tool.
2. It should deionize rapidly after spark discharge has taken place.
3. It should have low viscosity and good wetting capacity.
4. It should be chemically neutral to as not to attack the electrode, the work-piece and the working container.
5. Its flash point must be sufficiently high to avoid any fire hazards.
6. It should not emit any toxic vapors or have unpleasant odours.

7. It should be easily available in market at reasonable rate.
8. It should maintain its properties under all working conditions.

d) How surface hardening of steel is carried out using induction heating?

Ans: Diagram: 2 marks



Explanation: 2M
Surface hardening

- Is the process of hardening the surface of a metal object while allowing the metal deeper underneath to remain soft, thus forming a thin layer of harder metal (called the "case") at the surface.
- The object to be surface harden is kept in helical coil (work coil) made of tubing.
- A heavy current at high frequency about 400 KHz is passed through the work coil for about 5 - 10 sec.
- When the temperature of the surface up to desired depth reach the required level, current flowing through work coil is stopped.
- And the job is immediately quenched either in the coil or in the water.
- Because of very fast increase in temperature at the surface there is no bulk heating of the objects and hence the other properties of the material remain unaltered.
- Surface hardening is used in making cams, knives, and surgical needles, saw blades, crankshafts, bearing etc.

B) Attempt any one: 6 marks

a) What is part programming? Explain manual part programming.

Ans: - Part program is the set of instruction which instruct the machine tool about the processing steps to be performed for manufacturing of component. Part programming is the procedure by which the sequence of processing steps is planned and documented.

(**1Mark**)

A typical NC word consist of X- position, Y – position feed rate etc A collection of NC words is called a block and a block of words is a complete NC instruction.
There are 8 types of NC words like N- word, G- word, X, Yand Z words, F- word, S- word , T-word, M-word all EOB**.**
(1 Mark)
N – Word (sequence number)
The sequence number is used to identify the block and the 1st word in every block is the sequence no.
G – Word (preparatory function)
The preparatory word prepares the control unit to execute the instruction that are to follow.
Co- ordinate (X, Y, & Z word)
These words give final co- ordinate positions for X, Y, & Z motions.

The words I, J, K are used to specify the position of arc center in case of circular interpolation**.**
[2marks]

Feed function – F – word
The feed function is used to specify the feed rate in the machining operation.
S – Word (spindle speed function)
The spindle speed is specified either in revaluation per minutes (rpm) or as meter per minutes.
Tool selection function (T –word)
The T - word is needed only for m/c s with programmable tool turret or automatic tool change (ATC**).**
(1 Mark)

Miscellaneous function (M – word)
The Miscellaneous function word is used to specify certain Miscellaneous or auxiliary function which do not relate to the dimensional movements of the machine.
End of block (EOB)
The EOB symbol identifies the end of instructions block**.**
(1Mark)

b) Compare induction heating and dielectric heating.(any 6 points)
Ans. (any 6 points) 1M each

Induction heating	**Dielectric heating**
1. Used for heating magnetic materials	Used for heating non-conductive materials
2. Uses eddy current loss for heating.	Uses dielectric losses for heating.
3. Depth of penetration is an important factor.	Distance between two conducting plates is an important factor.
4. Used for surface heating	Used for body heating
5. Heat is produced is proportion to square of current.	Heat produced depends on the square of voltage.
6. . Frequency range from Hz to KHz	Frequency range is in MHz
7. It has no conduction, convection losses.	It has losses like conduction, convection and radiation.
8. Applications: Brazing, Surfacehardening of steel, Annealing of brass& bronze	Applications: Electronic sewing, Food processing, Gluing of wood

Q5. Attempt any four: 16 marks

a) Give the classification of NC system.

Ans: **(1M each)**
NC machines are classified as:-
1. According to control system –
   a) Point to point control system
   b) Straight line control system
   c) Continuous path or contouring control system

2. According to co-ordinate system-
a)Incremental system
b) Absolute system

3. According to feedback- Open loop system and Closed loop system

4. According to structure-Analog system and Digital system

b)Name sequential steps involved in liquid penetrant testing.

Ans: steps: 4marks

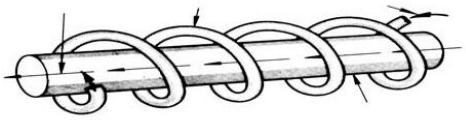
The main steps of liquid penetrant inspection are:
Pre-cleaning: the test surface is cleaned to remove any dirt, paint, oil ,grease by using solvents, alkaline cleaning, etc.
Application of penetrant: The penetrant is then applied to the surface of the item being treated.
Excess penetrant removal: The excess penetrant is then removed from the surface
Application of developer: A white developer is applied to the sample and draws penetrant from defects out onto the surface to form a visible indication.
Inspection and then post cleaning.

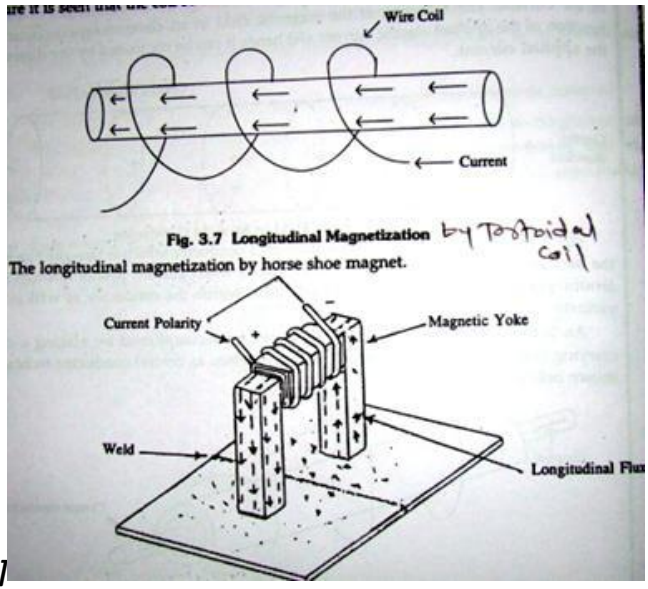
c) How non-destructive testing is carried out using coil-shot method?

Ans: Explanation :2M, Diagram :2M

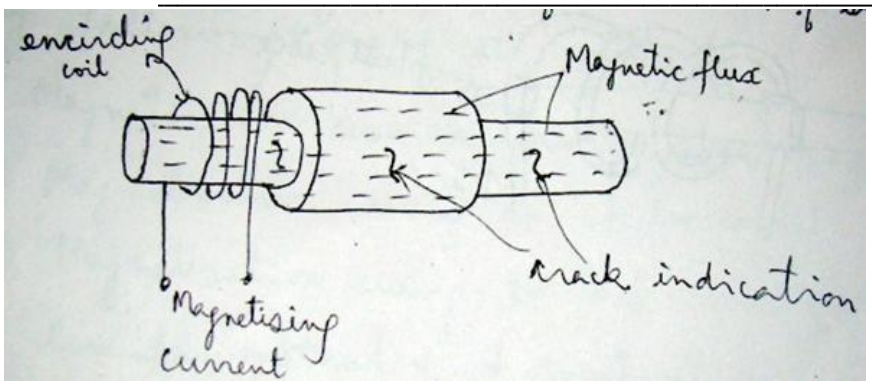
The component is placed longitudinally in the concentrated magnetic field that fills the center of a coil or solenoid. This magnetization technique is often referred to as a "coil shot."

Longitudinal magnetization- it is used to detect the circular cracks i.e diameter wise cracks in the material. To produce the longitudinal magnetization the magnetizing current has to be passed in circular direction through the object. Or If a component is placed longitudinally within a coil carrying the current, the flux will be generated in the component giving north and south poles at its end.
The current flows circularly along the circumference of the test piece and Magnetic lines of force that runs parallel to long axis of the part





[Note any 1 diagram 2 mks]



c) Describe the technique used for recording results in MPT.

Ans: Any one can be considered.
Explanation :4M
1) Strippable Lacquer film
- One method is fixing the indication semi-permanently on the part is by using clear lacquer. In order to do this the part must be dry ; if the wet method has been used to develop the indication, the vehicle should be allowed to evaporate.
- It is usually desirable to thin out the clear lacquer by adding lacquer thinner. The lacquer should either be sprayed on the part or flowed on since brushing would smear the indication.

2) Transparent Tape Transfer:
- It is also possible to preserve an indication on a part by converting it with transparent pressure sensitive tape.
- Before applying the tape, the vehicle used in the wet method should be removed by means of evaporation.

An accurate record of an indication can be obtained by lifting the particles forming the indication from the part with transparent pressure sensitive tape (such as Scotch brand) and then placing the tape on stiff white paper.
- If the indication is formed of dry powder particles, excess powder should be removed from the surface by gentle blowing. Use a piece of tape larger than the indication and gently cover the indication with the tape. Gentle pressure should be applied so that the adhesive will pick up the particles; do not press too hard or the indication will be flattened too much and the tape may be difficult to remove. Carefully lift the tape from the part and press it onto the record sheet or report
- Tape transfers can be taken of fluorescent particle indications, but such preserved indication usually must be viewed under black light to properly interpret them. It is commonly used to lift the indication from the part. The tape can be photographed or directly placed into a permanent record book.

e) What is DNC? Write advantages and disadvantages of DNC.

Ans**: DNC- 2 marks:-**
DNC-means direct numerical control machine-
DNC refers to the system of the several machine tools directly controlled by the central computer. The DNC system operates on the principle of time sharing mode. Each machine tool in DNC system has its own program along with the supervisory program linking them and establishing the priority whenever necessary.

Advantages of DNC: any1 point - 1 mark

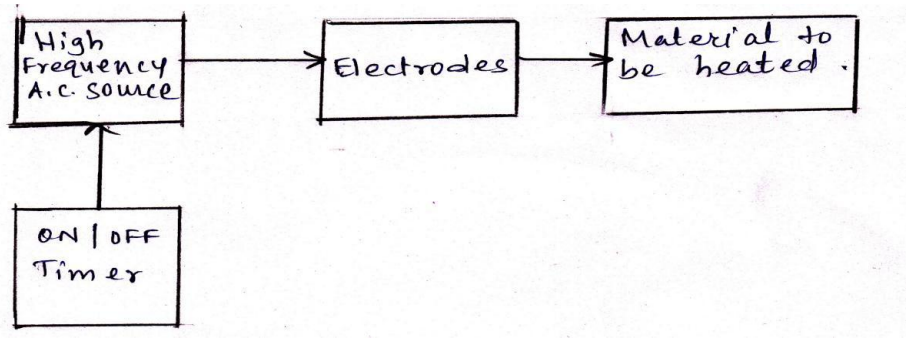
- Can upload, download, or run the CNC control in a direct DNC mode from the control itself without requiring any add-on hardware.
- Simultaneous communication sessions with up to 128 CNC machines from a single PC at speeds of up to 230,400 baud.
- Option that allows multiple DNC clients to control one or more DNC servers over a TCP/IP network.
- Any file can be sent to any control at any time, even from the shop floor.
- Easy connections to LAN systems.

Disadvantages of DNC: any 1 point - 1 mark

1. Total production stops if the main computer starts malfunctioning.
2. The system is not user friendly as any modification is difficult to make.
3. The system maintenance is another problem in central computer as well as local controller system.
4. The software logic, timing problems and interfacing vary from one system to another.

f) Draw and explain the block diagram of dielectric heating.

Ans: Block diagram 2M



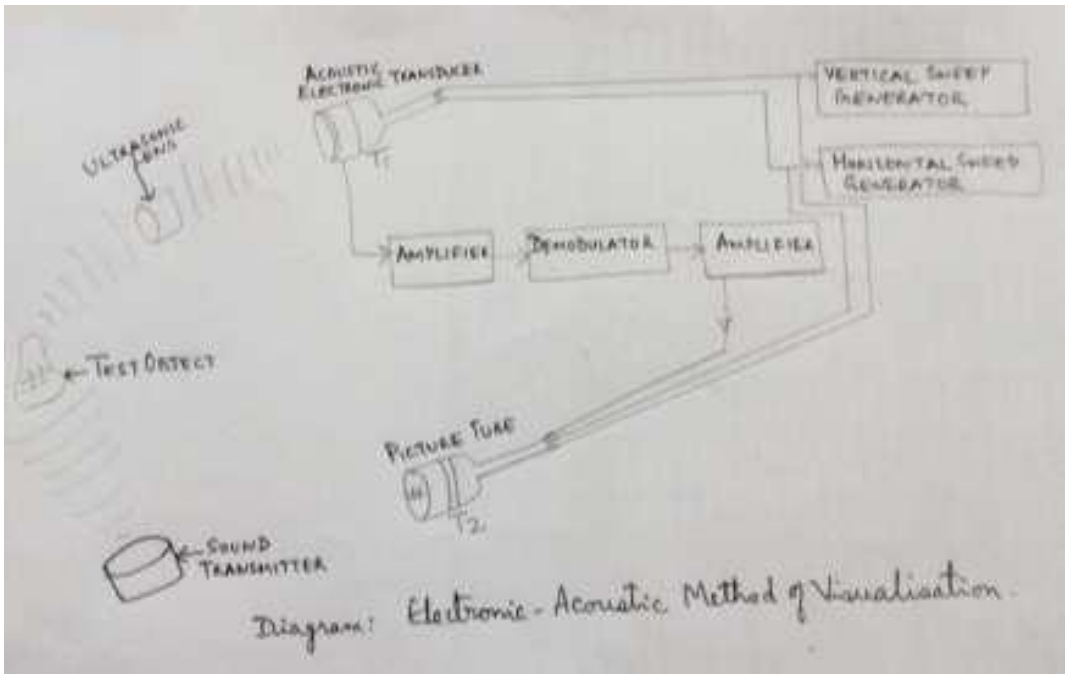
Explanation: 2M

- The block diagram of dielectric heating consists of high freq. ac source which provide alternating current to electrodes.
- The material to be heated (job) is placed between the two electrodes which may be parallel plates.
- The job acts as a Dielectric between two electrodes of capacitor.
- During charging and discharging of the capacitor, the molecular arrangement of the job changes because of continuous stress created by the electric field.
- The current drawn by it is never leading the voltage by exactly 90 degrees.
- The angle between current and voltage is less than 90 degrees as a result of which there is small change in phase component of the current.
- This current produces power loss in a Dielectric of a capacitor. This power loss increases with the increase in frequency.
- This change in molecular arrangement results in generation of heat in the job.
- The reset timer is used to switch the power source on and off for heating and cooling processes. The timer operation may be fixed time or according to the feedback used in process.

Q6. Attempt any four: **16 marks**

a) Draw the block diagram and explain electronic acoustic method.

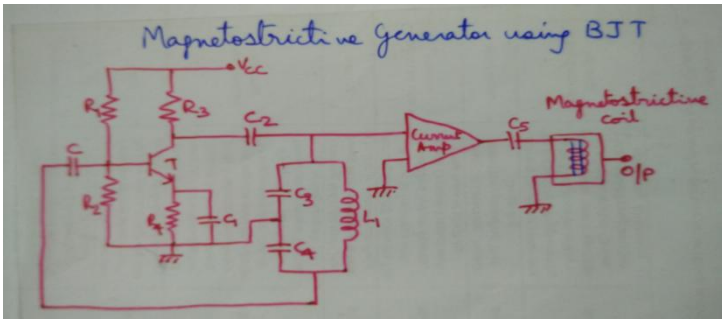
Ans: Diagram :2M



Explanation :2M

- The sound relief is projected by means of a sound lens on the target plate of acoustic-electronic transducer, which is barium titanate ceramic piezo-electric plate.
- On the inner side of the transducer plate appears distribution of the electronic potential corresponding to the sound relief.
- At the point of incidence of beam, secondary electrons are knocked off from the transducer plate, collected by a collector plate- an amplitude modulated signal.
- After amplification and demodulation, the signal is fed to the picture tube T2.
- The electron beam in the picture tube scans the screen in synchronism with the scanning process in tubeT1.
- Thus, we get at the screen of the picture tube, a visible image of the sound relief and it displays the non-homogeneities of the object.

b) Describe magnetostrictive generation of ultrasonic with neat circuit diagram.
Ans: Diagram:2 Marks

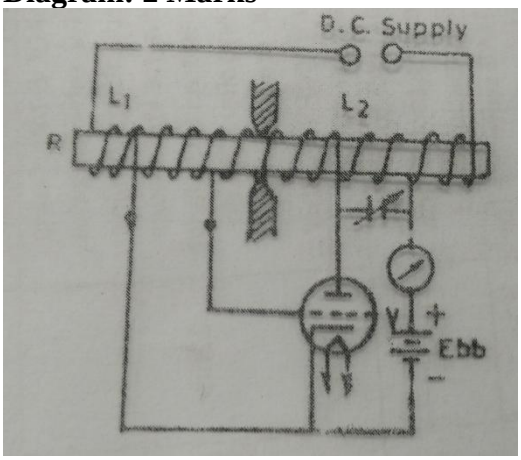


Explanation: - (2 mark)

1) The transistor is used as a basic oscillator. The oscillator circuit may be Colpitts type or Hartley type.
2) The above circuit shows Colpitts oscillator. The transistor T works as an oscillator with the tank circuitcomponents as C3, C4 and L1 .these components also helps to determine the frequency of ultrasonic wave.
3) The oscillations generated by transistor are applied to current amplifier where level of signal is increased sothat it drives magnetostrictive coil.
4) These oscillations are coupled to the coil with the help of capacitor. Due to magnetostrictive effect, ultrasonicvibrations are generated at the output.

OR

Diagram: 2 Marks



Explanation: - (2 mark)

1) The rod of the ferromagnetic material is used. It is seen that rod is clamped at center with the knife edges.
2) The two wires L1 and L2 are wound on the rod.
3) The wire L1 along with the capacitor C forms the tank circuit of the oscillator and helps to determine thefrequency.
4) The wires L1 is used in the grid circuit of triode.
5) The supply voltage VBB is applied them due to the reciprocal effect of magnetostriction the vibrations are setinto the rod.
6) The ammeter is used in plate circuit to detect the oscillatory condition.
7) During resonance the anode current shows maximum ammeter deviation thus for simplicity thepre-magnetized rod is used in circuit.

c)Describe wet method used in MPT.

Ans:Wet method: 4M

i) In this methods particles are carried liquid suspension.
ii) Liquid carrier is usually a water or kerosene.
ii) The liquid carrier provides mobility to particles with extended period of time which allows enough particles to float to small leakage field to form a visible indication.
iii) Wet particles are kept in the bath which has to continuously kept agitated so that no particles will settle down at the bottom
iv) High sensitivity is possible with method when fluorescent particles are used.

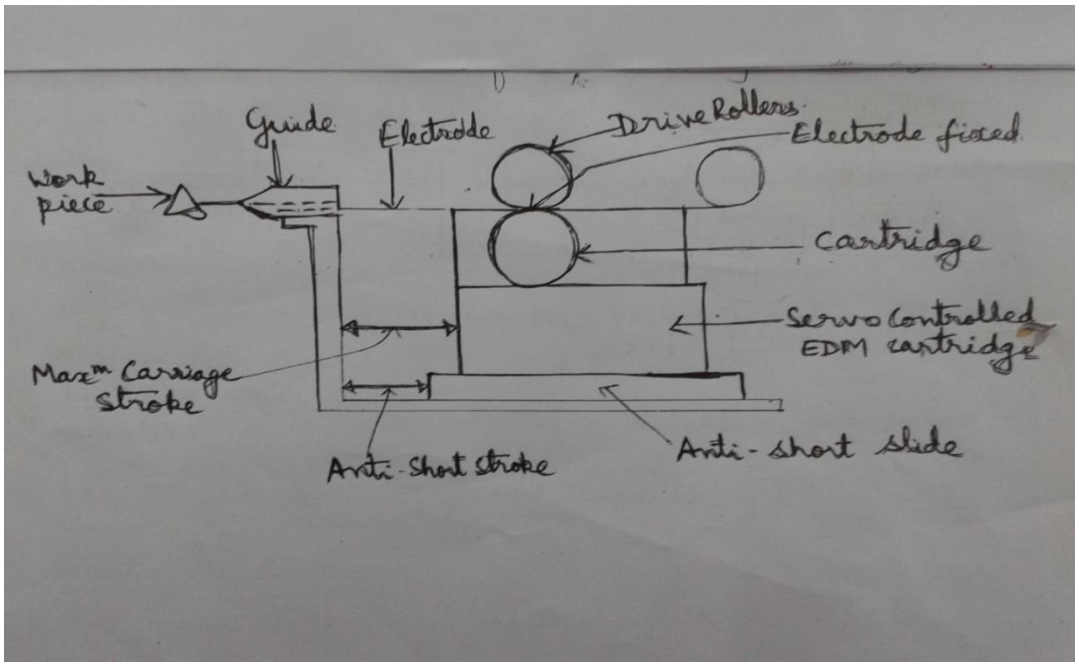
d) List applications of EDM and explain any one.

Ans: Applications of EDM: Any two--1 mark

1. Microhole drilling
2. Wire cut edm
3. Coinage die makingedm
4. Metal disintegration machiningedm
5. prototype production edm, etc

Note: Any other application can also be considered.

Diagram of micro-hole drilling edm:2 mark

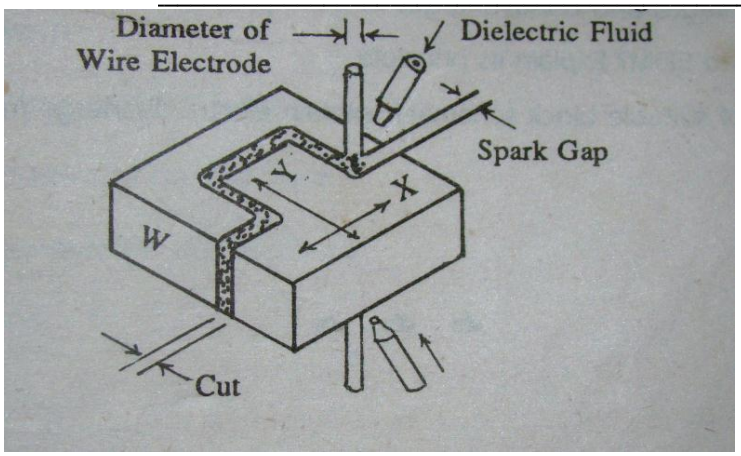


Explanation 1 marks

- EDM microhole drilling is a special application of EDM technology for drilling 0.05 mm to 1mm diameter.
- Electrode used is fine and stiff and other subsystems are similar to other EDM
- Spark is generated between the work piece and the electrode.
- The heat of the spark vapourishes small bits of workpiece.
- Smalll bits are then flushed away using deionized water.

OR

Diagram of wire cut edm:1 mark



Explanation: -(2 mark)

- In traveling wire EDM a small diameter wire is used as the electrode to produce intricate shape in plates.
- Above fig. illustrates the arrangement of wire electrode and work piece of wire cut EDM.
- The table of the machine is provided with numerical control to perform complex motion required by the work piece. The feed rate in this process is constant. But if any abnormal condition in the spark gap are restored.
- The machine has a wire guide and tensioning device to permit continuous feeding of the expandable copper or brass wire electrode with diameter 0.2 mm or less as shown in fig.
- The spark discharge is produced in the spark gap between wire electrode and work piece by the controlled pulsing of direct current as shown in fig.
- Each spark produces enough heat to melt and vaporize a tiny volume of the work piece material.
- Deionized water is used as the dielectric medium as this process requires a dielectric with low conductivity to provide larger spark gap. The dielectric fluid is injected through nozzle in the working area to ensure proper flushing.
- The wire cut EDM is extremely well suited in the production of extrusion dies, blanking dies and punches press tools and sintered compacting dies.

e) **Describe absolute and incremental used in NC system.**

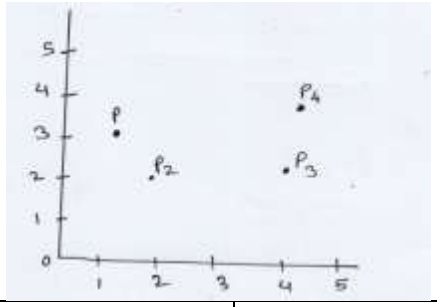
Ans:- Absolute co-ordinate system:- 2M

1) In this system the co-ordinates of a point are always referred with reference to the same datum.
2) The datum positions in the x-axis ,y-axis and z-axis are defined by the user before starting the operation.
3) The advantage is, it is very easy to check and correct a program written using this method.

Incremental coordinate system:-**2M**

1. In this system the coordinates of any point are calculated with reference to the previous point.
2. It is difficult to check a point program written in increment dimensional mode.

Eg. The coordinates of points P_1 ,P_2,P_3,P_4in absolute and incremental system are given as.



Point	Absolute system	Incremental system
P1	1,3	1,3
P2	2,2	2,-1
P3	4,2	1,0
P4	4,4	0,1

(NOTE:- Any other correct example can be given full marks.)

.