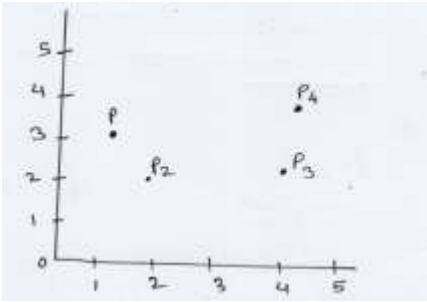


**WINTER– 16 EXAMINATION****(Subject Code: 17542)****Model Answer****Important Instructions to examiners:**

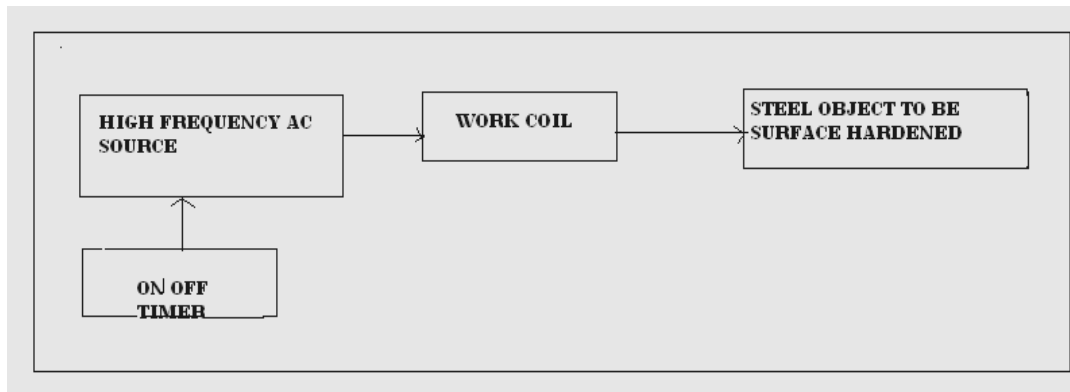
- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling 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 judgement 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.

Q. No.	Sub Q.N.	Answer	Marking Scheme
Q.1		Attempt any <u>Three</u>	12-Total Marks
1	a)	What is industrial safety? List out industrial safety related standard.	4 M
	Ans:	Industrial safety: may be defined as the methodology to prevent accidents. OR as policies and protections put in place to ensure plant and factory worker protection from hazards that could cause injury. Industrial Safety standards: (Any 2 can be considered) 1. ASTM- American Society for Testing & Materials 2. ISO-International Organization for standardization 3. AWS-American Welding Society 4. ASME-American Society of Mechanical Engineering. 5. CEN-European Committee for Standardization	2M 2M
	b)	Name different types of probes used in ultrasonic flaw detection. State material used.	4 M
	Ans:	Probes are classified into groups according to the application- 1) Contact Probes a) Dual Element Probes b) Delay Line Probes c) Angle Beam Probes d) Paint Brush Probes e) Normal beam probes or straight beam probes 2) Immersion Probes	Types of probes:3 M and material used : 1 M (Any one

	Material used are barium titanate, Rochelle salt, quartz, etc	can be considered)															
c)	Explain incremental and absolute system.	4 M															
Ans:	<p>Absolute co-ordinate system:-</p> <p>1) In this system the co-ordinates of a point are always referred with reference to the same datum.</p> <p>2) The datum positions in the x-axis, y-axis and z-axis are defined by the user before starting the operation.</p> <p>3) The advantage is, it is very easy to check and correct a program written using this method.</p> <p>Incremental coordinate system:-</p> <p>1. In this system the coordinates of any point are calculated with reference to the previous point.</p> <p>2. It is difficult to check a point program written in increment dimensional mode.</p> <p>Eg. The coordinates of points P1 ,P2,P3,P4 in absolute and incremental system are given as.</p>  <p>(Note: Any other example can be considered)</p> <table border="1"> <thead> <tr> <th>Point</th><th>Absolute system</th><th>Incremental system</th></tr> </thead> <tbody> <tr> <td>P1</td><td>1,3</td><td>1,3</td></tr> <tr> <td>P2</td><td>2,2</td><td>2,-1</td></tr> <tr> <td>P3</td><td>4,2</td><td>1,0</td></tr> <tr> <td>P4</td><td>4,4</td><td>0,1</td></tr> </tbody> </table>	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	<p>2M</p> <p>2M</p>
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															
d)	How surface hardening of steel is carried out using induction heating?	4 M															
Ans:	<p><u>Surface hardening :</u></p> <p>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.</p> <p>The object to be surface harden is kept in helical coil (work coil) made of tubing.</p> <p>A heavy current at high frequency about 400 KHz is passed through the work coil for about 5 - 10 sec.</p> <p>When the temperature of the surface up to desired depth reach the required level, current flowing through work coil is stopped.</p> <p>And the job is immediately quenched either in the coil or in the water.</p> <p>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.</p> <p>Surface hardening is used in making cams, knives, and surgical needles, saw blades,</p>	2M															

crankshafts, bearing etc.

Diagram:

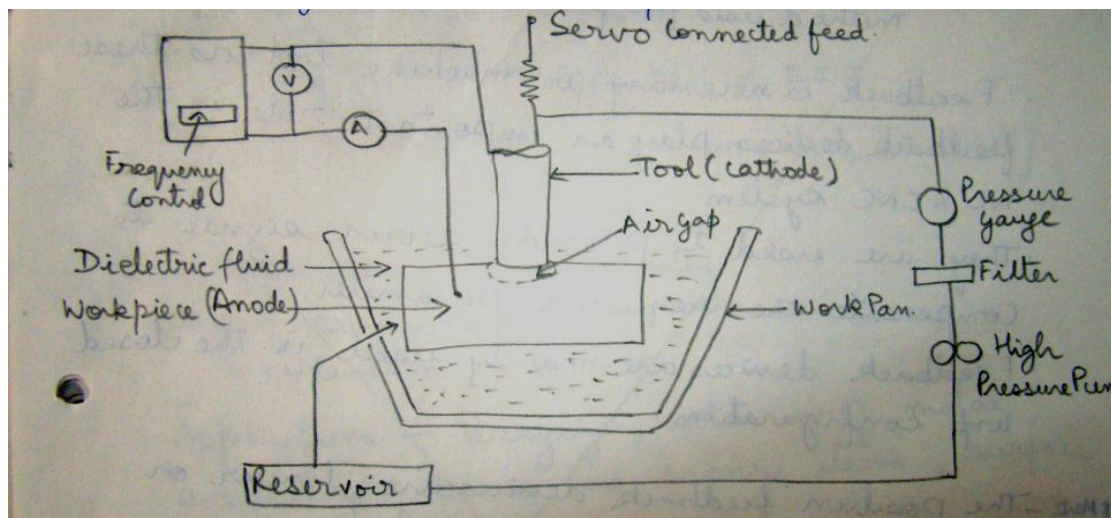
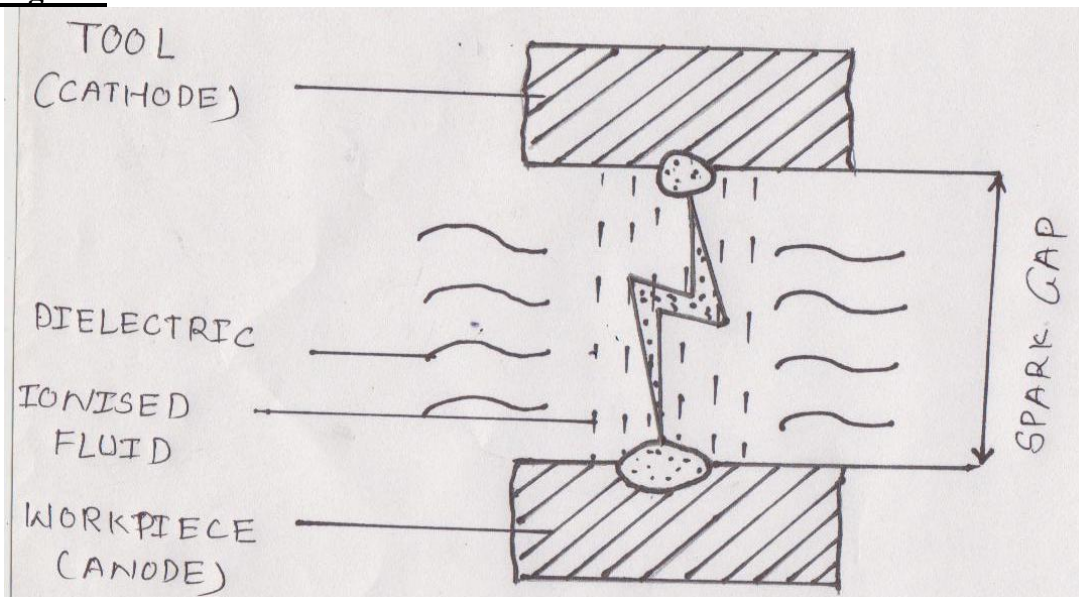


2M

B)	Attempt any <u>one</u> :	6 M															
a)	Compare dry method and wet method of MPT.	6 M															
Ans:	<table border="1"> <thead> <tr> <th>Sr No</th><th>Dry method</th><th>Wet method</th></tr> </thead> <tbody> <tr> <td>1</td><td>Ferromagnetic particles in dry form are applied as inspection media over the surface of work- piece to be tested.</td><td>Ferromagnetic particles are suspended in some liquid to apply as a inspection media over the surface of work- piece to be tested.</td></tr> <tr> <td>2</td><td>It is a slow process of crack detection</td><td>It is a fast process of crack detection</td></tr> <tr> <td>3</td><td>It is not useful for irregular and complex shape jobs.</td><td>It is useful for irregular and complex shape jobs.</td></tr> <tr> <td>4</td><td>Less costly method for crack detection</td><td>costly method for crack detection</td></tr> </tbody> </table>	Sr No	Dry method	Wet method	1	Ferromagnetic particles in dry form are applied as inspection media over the surface of work- piece to be tested.	Ferromagnetic particles are suspended in some liquid to apply as a inspection media over the surface of work- piece to be tested.	2	It is a slow process of crack detection	It is a fast process of crack detection	3	It is not useful for irregular and complex shape jobs.	It is useful for irregular and complex shape jobs.	4	Less costly method for crack detection	costly method for crack detection	
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b)	Describe basic principle of EDM with EDM set up.	6 M															
Ans:	<p><u>Principle:</u></p> <ul style="list-style-type: none"> 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. <p style="text-align: center;">OR</p>	4M															

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.

Diagram:



2M
Any
Diagram
Should
given
Marks.

Q 2

Attempt any four:

16

a)

What is the role of electronics in modern industry?

4M

Ans:

NOTE: Answer to this question will vary from student to student. Examiner shall see that how a student correlates the different techniques studied under subject AIE to the modern industry.

(Any 4
points 4 M
or any other
point can
also be
considered.)

Because of the development in science and technology there is an requirement of new process in the industry which are developed by using different electronics components,

circuits, principles and new advance techniques.
Electronics has an important role in modern industry.
Electronics plays a catalytic role in enhancing production and productivity of the industry. All industry use the modern techniques of production which involves measurement and control equipment's, Automation techniques etc.
For example,
1. CNC machine use for mass production uses different electronics circuits to have control and accuracy in measurement.
2. Non-traditional machining such as EDM, Laser cut machining uses the electronics principles for the operations.
3. Modern Heating techniques use in industries such as Induction, dielectric, microwave heating is the result of development in the in the field of electronics.
4. With the development in VLSI and Embedded systems there is an revolution in computer field which gives revolution to the modern industry and hence the economy.
5. Different NDT methods used in industry for material testing and job testing also uses the electronics techniques. Good example is the testing of rail way tacks for any crack using Ultrasonic Testing.

OR

The role of electronics in modern industry helps in the following :

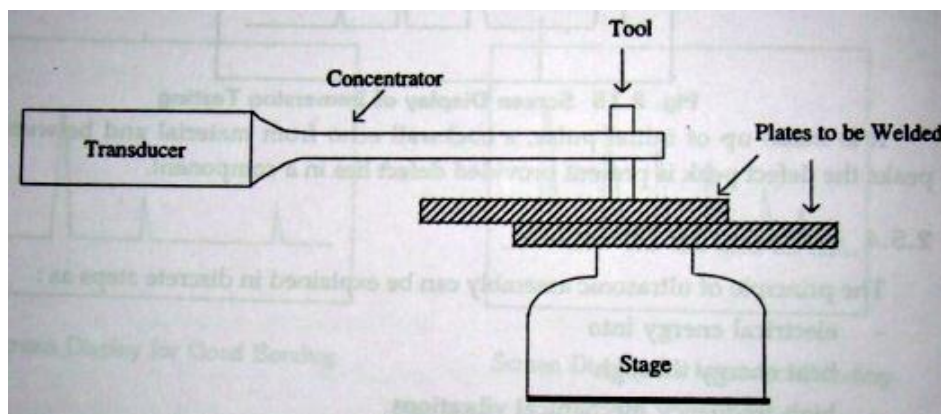
- i) Better working conditions are available.
- ii) Production rate is increased.
- iii) Overall production cost is reduced.
- iv) Quality and reliability of product is higher.
- v) Component procedure is uniform.
- vi) Human fatigue is reduced.
- vii) Automatic process control

b) Explain the process of cold welding using ultrasound.

4M

Ans: : Diagram :

2M



Explanation:

2M

- 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 concentrator is attached to a powerful ultrasonic generator as shown in Figure.

- The metallic sheets to be welded are put together under the tip of concentrator.
- The concentrator 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.

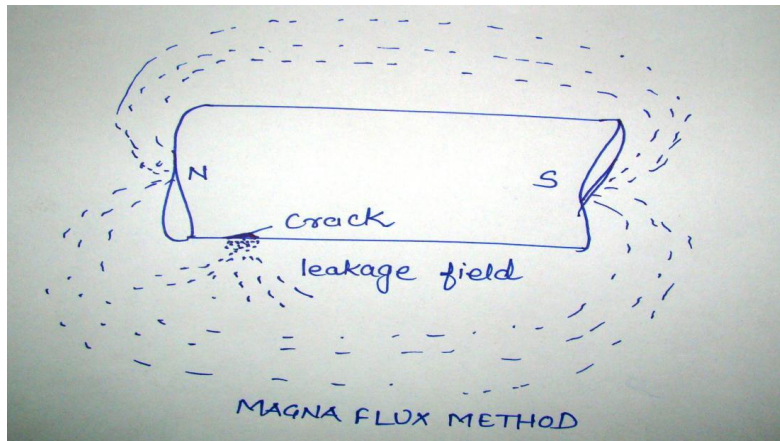
Thus, the two sheets get welded without heating. This process is known as cold welding.

c) Explain the principle of MPT.

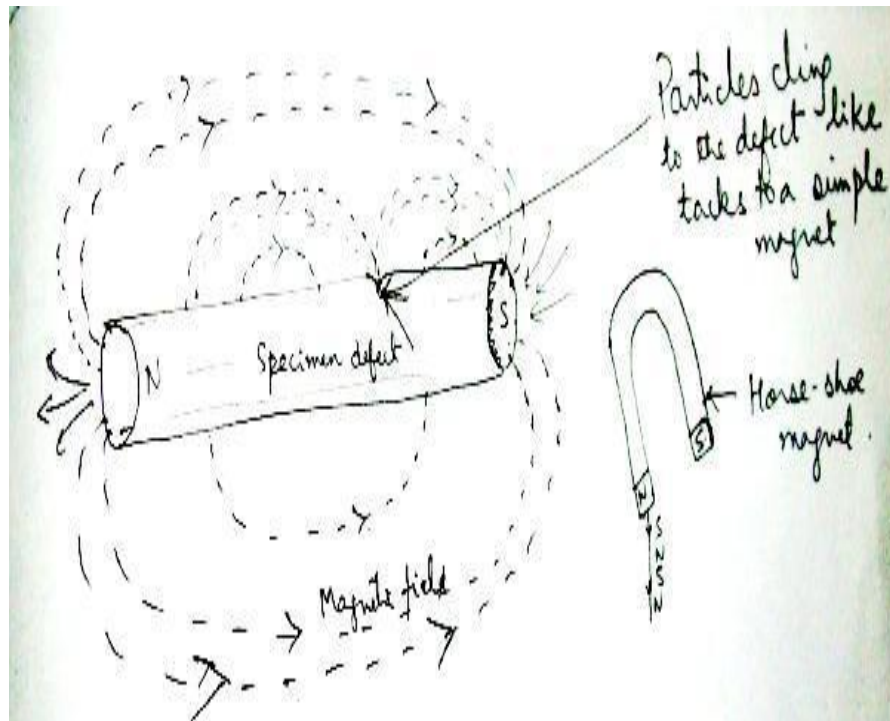
4M

Ans: Diagram :

2M



OR



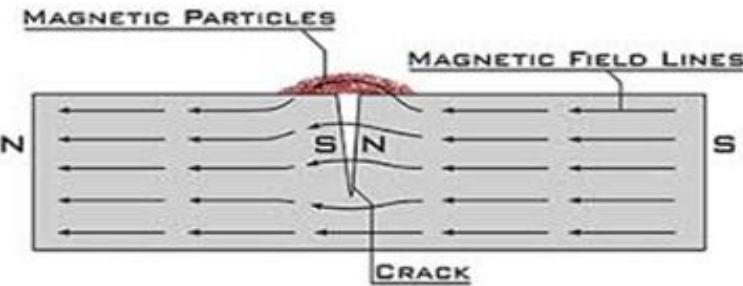
Explanation:

It is non-destructive testing method that makes use of magnetic field and magnetic particle to inspect material discontinuity lies. Lines of flux that are generated with the test of pieces, when encounter defect generate small leakage magnetic flux as shown as

2M

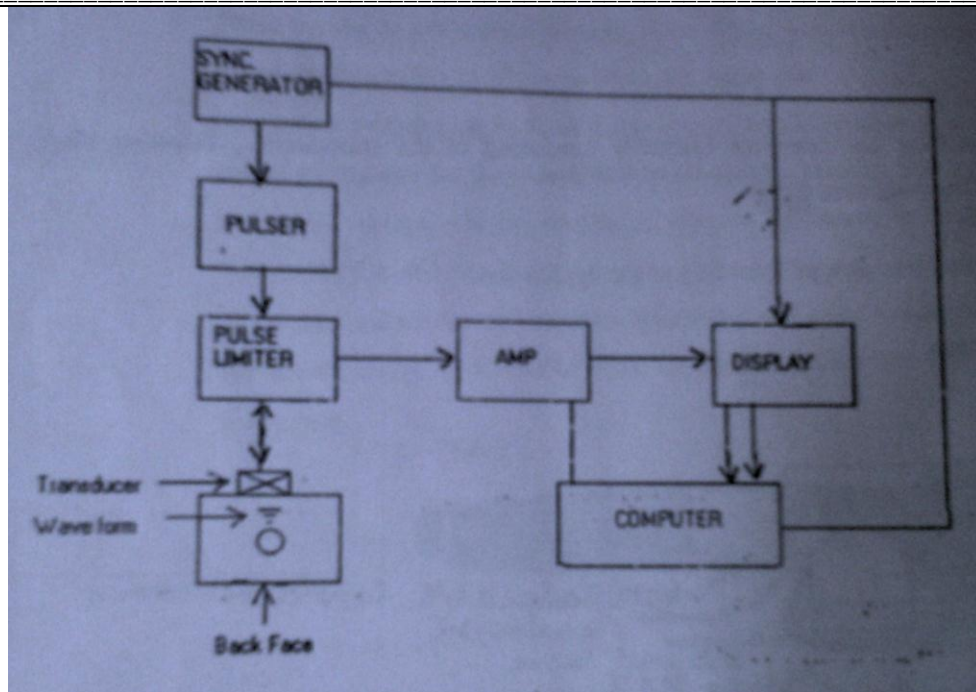


		<p>be parallel plates.</p> <ul style="list-style-type: none"> • The job acts as a Dielectric between two electrodes of capacitor. • During charging and discharging of the capacitor, the molecular arrangement of the job changes because of continuous stress created by the electric field. • The current 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. 	
	f)	State the principle of IR heating.	4M
	Ans:	<p>Principle:</p> <ul style="list-style-type: none"> • Electro-magnetic radiation at Infra-Red frequencies is focussed on the object to be heated and then heating of the material is carried out. • Infra-red frequency is less than 4×10^{14} Hz • It is used in quick and uniform drying of the layer of the fresh paint, without wastage of energy. • It is used as pain killer in medical therapy. 	4M
Q. 3		Attempt any four:	16M
	a)	What are the problems in traditional industries? How are these overcome in modern industries?	4M
	Ans:	<p>1. Human Dependency: the various problems caused due to human dependency were quality of work, non-uniformity, time management.</p> <p>2. Mass Production: Mass production in specified time was not possible since methods used were time consuming and could not cope up with the increasing demand.</p> <p>3. Quality: Inability to implement Quality Standards accurately and uniformly affected quality of the product.</p> <p>4. Complex Machining: The traditional machining processes are inadequate to machine advanced alloy material into complex part from the standpoint of economic production.</p> <p>To overcome these problems in traditional industries modern industries are using non-destructive techniques such as ultrasonic flaw detection and magnetic particle testing, different new machining techniques such as EDM, atomically operated machines like NC/CNC (for mass production) and controlled heating techniques.</p>	(List problems: 2 m, how to overcome: 2 m)

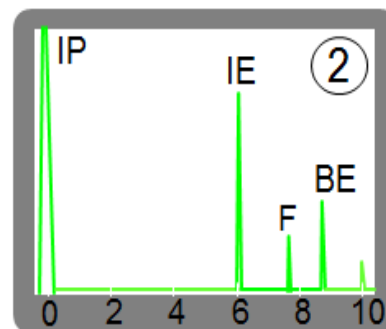
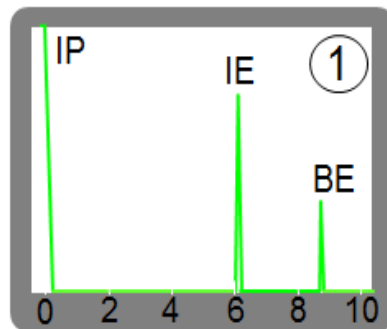
b)	Describe with neat diagram magna-flux method.	4M
Ans:	<p><u>Explanation:</u></p> <p>Magnaflux method(Wet Suspension Inspection)</p> <ul style="list-style-type: none"> Wet suspension magnetic particle inspection involves applying the magnetic particles while they are suspended in a liquid carrier. <p><u>Diagram:</u></p>  <p><u>Steps in performing inspection using wet suspension</u></p> <ol style="list-style-type: none"> 1) Prepare the part surface <ul style="list-style-type: none"> The surface must be free of grease, oil and moisture that could keep particles from moving freely. A thin layer of paint, rust or scale will reduce test sensitivity but can sometimes be left in place with adequate result. Any loose dirt, paint rust or scale must be removed. 2) Apply the suspension: <ul style="list-style-type: none"> The suspension is gently sprayed or allowed to flow over the surface of the part 3)Apply the magnetizing force: <ul style="list-style-type: none"> The magnetizing force should be applied immediately after applying the suspension of magnetic particles. When using a wet horizontal inspection unit the current is applied in two or three short bursts (1/2 sec) witch help to improve particle mobility. 4)Inspection for indications: <p>Look for areas which the magnetic particles are illustrates surface discontinuous will produce a sharp indication</p> 	<p>Diagram:2 M,Explanati on:2M</p>
c)	State essential functions of spark generator in EDM set up.	4M
Ans:	<p>The essential functions of spark generator are as follows:</p> <ol style="list-style-type: none"> To supply adequate voltage to indicate & maintain spark discharge. To adjust discharge current intensity. To adjust discharge duration. To control repeatability process of discharge. 	(Each point 1M)
d)	What are the limitations of manual part programming?	4M
Ans:	1.Manual part programming is a time consuming process.	(Each point



		2.It needs an expert part programmer. 3.Format or types of information required for two machines may be different therefore the part programmer expert on one machine may not expert on other machine. 4.With modern NC/CNC machines where more than three axes are to be controlled ,it may difficult for part programmer to develop the program manually.	1M)																	
e)	Comparison between induction heating and dielectric heating.		4M																	
Ans:	<table><tr><th>Induction heating</th><th>Dielectric heating</th></tr><tr><td>1. Used for heating magnetic / metallic materials</td><td>Used for heating non-conductive materials</td></tr><tr><td>2. Uses eddy current loss for heating.</td><td>Uses dielectric losses for heating.</td></tr><tr><td>3. Depth of penetration is an important factor.</td><td>Distance between two conducting plates is an important factor.</td></tr><tr><td>4. Used for surface heating</td><td>Used for body heating</td></tr><tr><td>5. Heat is produced is proportion to square of current.</td><td>Heat produced depends on the square of voltage.</td></tr><tr><td>6. . Frequency range from Hz to KHz</td><td>Frequency range is in MHz</td></tr><tr><td>7. It has no conduction, convection losses.</td><td>It has losses like conduction, convection and radiation.</td></tr><tr><td>8. Applications: Brazing, Surfacehardening of steel, Annealing of brass& bronze</td><td>Applications: Electronic sewing, Food processing, Gluing of wood</td></tr></table>	Induction heating	Dielectric heating	1. Used for heating magnetic / metallic 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	(Any four points: 1M each)
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Q. 4	Attempt any three:		12 M																	
a)	Give features of modem industry.		4 M																	
Ans:	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.		½ M Each																	
b)	Draw neat block diagram of ultrasonic flaw detector with echo pulse wave form in CRO.		4 M																	
Ans:	<u>Block Diagram:</u>		(Block diagram: 2M, echo pulse wave form: 2M)																	



Waveforms:



c)

Explain the principle of induction heating with a neat diagram.

4 M

Ans:

Diagram:

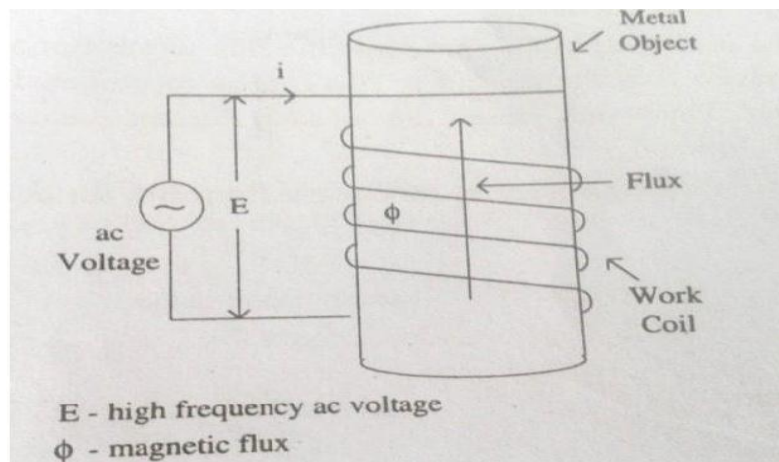
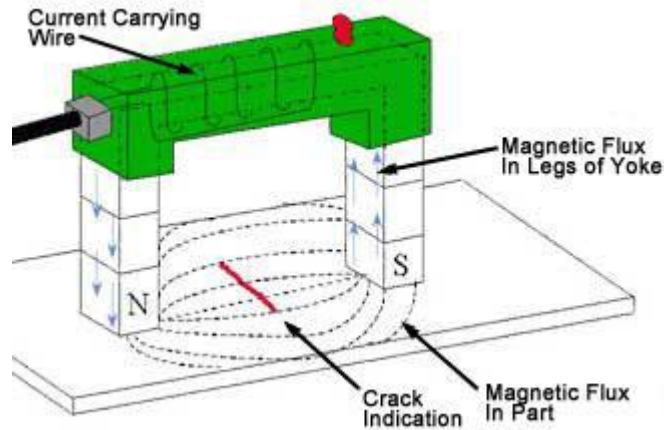


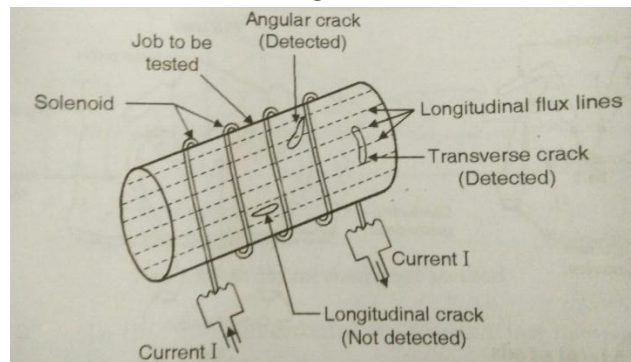
Diagram:2
M
Explanation
:2M



		<u>Explanation:</u> 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.	
	d)	State magnetostriction effect. State application of it.	4 M
	Ans:	<u>Magnetostriction effect:</u> <ul style="list-style-type: none"> • If a rod or tube of ferromagnetic material is brought into a magnetic field to its length, the length gets changed slightly. • The change in length is independent of sign of applied field and this may either increase or decrease depending on the nature of material, its previous treatment, the degree of magnetization and the temperature. • The phenomenon is called as magnetostrictive effect. The change in length caused is small being only about 1 part in a million. <u>Applications of magnetostriction effect</u> <ol style="list-style-type: none"> 1. To control the frequency of audio and radio electric oscillators. 2. For production of sound 3. To measure the elastic constants of metals 	(Magnetostriction effect 2M, Applications-2M)
B)		Attempt any one:	6M
	a)	Describe circular and longitudinal magnetization method with neat diagram.	
	Ans:	<i>Note: Any relevant diagram is acceptable</i> <u>Longitudinal Magnetization:</u> <ul style="list-style-type: none"> • A Longitudinal magnetic field has magnetic lines that run parallel to long axis of the part (length wise) as shown in figure below. The Longitudinal magnetic lines are applied by electromagnet such as coils & yoke. • The flux density resulting from Longitudinal magnetization is controlled by the current and no. of turns in the coil as well as the air gap between the coil and the part. • The length of the component several times larger than its diameter; a Longitudinal magnetization field can be established in the component. 	Circular method -3M and longitudinal magnetization method:3M

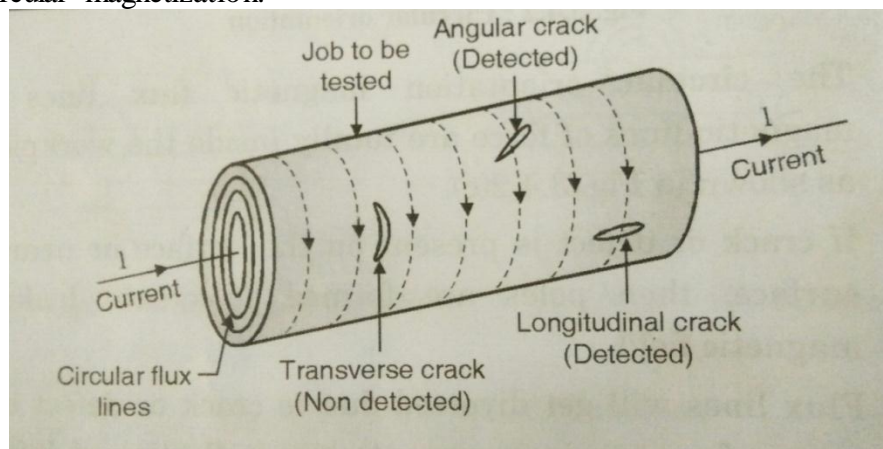


OR



Circular Magnetization:

- In this method high ampere range current is passed through the work piece to produce magnetic field.
- Magnetic flux lines get induced at right angles to the flow of current, so that it gives circular nature of flux lines and method of magnetization is called as circular magnetization.



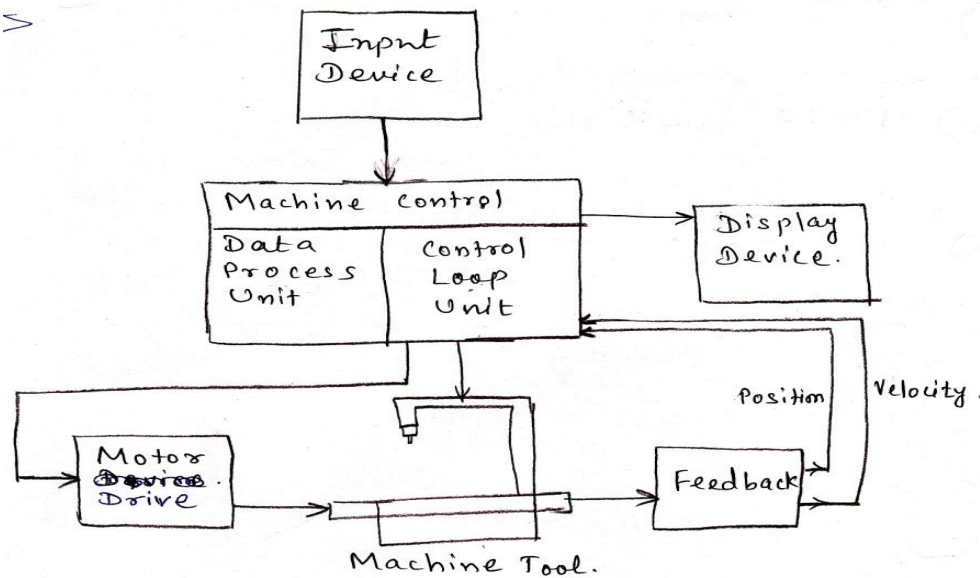
b) Draw the block diagram of CNC and describe the function of each block.

6M

Ans: Block Diagram:

Diagram:2

M
Description:
4M



Description:

Input Device:

- It can either be a floppy drive or USB flash drive, etc.
- The part program and other relevant data like work piece design image are stored in these.
- The data is further passed to the machine control unit.

Machine control unit:

- It is the heart of CNC
- All the motion, cutting etc., actions are controlled and coordinated by MCU
- MCU can be divided in two parts Data processing and control loop unit.
- The Data is accepted and understood by the data processing unit and according to this data control loop drives the motor drives.

Motor drives

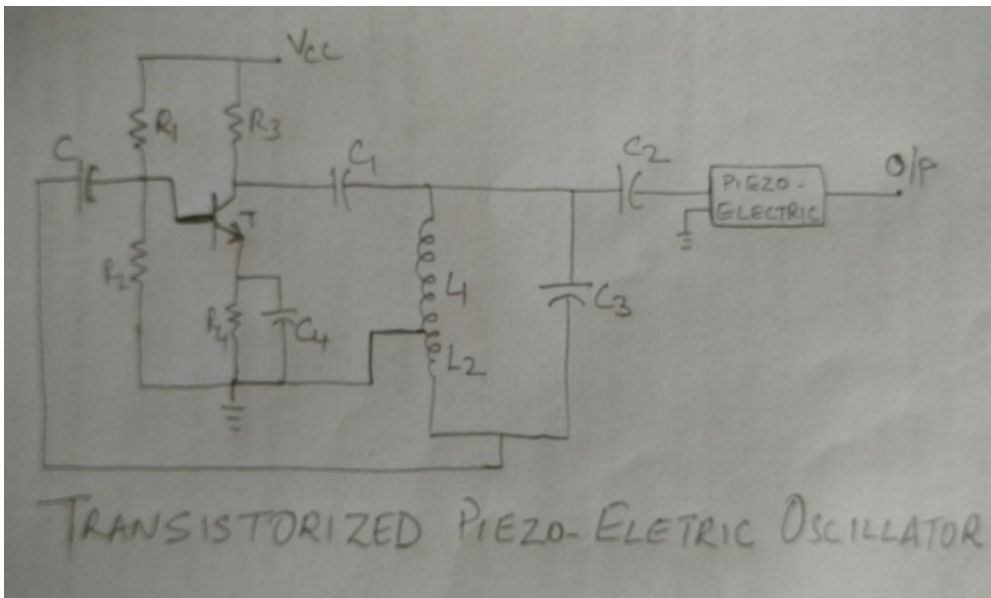
- It is the control system for all the motors involved in the CNC.
- It operates the one single motor or more motors at a time as per the requirement of the program

Machine tool:

- It is the table and tool assembly.
- The work piece is mounted on the table and appropriate action is performed over it using different tools.
- In CNC's either the work piece is stationary and tool is moving or other way round.

Feedback devices :

- This device operates on the continuous feedback available from the machine tool.
- For accurate and precise machining CNC's use closed loop system in which constant feedback is available.

		<ul style="list-style-type: none"> They compare the actual displacement, motion etc. with that of the references or base point and provide feedback. Two feedback position and velocity feedback are provided. <p>Display Devices:</p> <ul style="list-style-type: none"> The display device may be a CRT or LCD display. It displays the part programs and other data like the design image of the work piece being machined, finished work piece etc. It here by enables the observer to check the process whether the machining is being done properly or not. If any error is detected in the programs, it is displayed which can be rectified accordingly. 	
Q.5		Attempt any <u>FOUR</u> of following:	16 M
	a)	Describe measures of accident preventions.	4 M
	Ans:	<ol style="list-style-type: none"> Please read and understand the instructions before using any instrument, machine or plant. Only specialised personnel well trained about electricity and its effects must use it. Do not take measurements in an explosive atmosphere ie. gas, fuels or dust. Preventing shortcuts House-keeping should be proper Should never ignore safety procedures Do not touch exposed metal parts or circuits Prevent any accident contact of yourself or others with the measuring voltage. Safety symbols should be used and followed. One should be very careful while driving vehicle. 	<p>Any 8 points: 4 M</p> <p>Note: any other point can also be considered.</p>
	b)	Draw the transistorized circuit diagram of Piezoelectric effect for ultrasonic generation. Explain its working.	4 M
	Ans:	<p><u>Diagram :</u></p>  <p><u>Explanation:</u></p>	2M

[illegible]



	Hydraulic servo System.	
	<p>2) Dielectric fluid:</p> <ul style="list-style-type: none"> • The Dielectric fluid should have sufficient and stable dielectric strength to serve as insulation between electrode and tool. • It should de-ionize rapidly after spark discharge has taken place. • It should have low viscosity and good wetting capacity. • It should be chemically neutral to as not to attack the electrode, the work-piece and the working container. • Its flash point must be sufficiently high to avoid any fire hazards. • It should not emit any toxic vapours or have unpleasant odours. • It should be easily available in market at reasonable rate. • It should maintain its properties under all working conditions 	(Any 2 points :2 M)
e)	What is microwave heating? Give two applications of it.	4 M
Ans:	<p><u>Microwave heating:</u> Microwave heating is a high frequency heating which utilizes the frequency in the microwave range i.e. from 300 to 3000 MHz . In microwave Heating, the material is subjected to an electromagnetic wave that causes the molecules in the material to oscillate, thereby generating heat.</p> <p><u>Applications:</u> Microwave oven, Industries making use of these techniques includes textiles, paper , food, plastics and chemicals</p>	2M
f)	What is DNC and CIM system? List four factors for selection of components for CNC machining.	4 M
Ans:	<p><u>DNC-means direct numerical control machine-</u> 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.</p> <p><u>CIM - Computer Integrated Manufacturing -</u> Computer integrated manufacturing is used to describe the complete automation of a manufacturing plant, with all processes functioning under computer control. The heart of CIM is CAD/CAM, CAD/CAM integrated systems provide design/drafting, planning and scheduling and fabrication capabilities. CIM system improves capability of the component technology. It provides higher productivity. It also provides maximum flexibility, more reliable and saves time.</p> <p>Factors for selection of components for CNC machining.-</p> <ol style="list-style-type: none"> 1. The number of operations per component is large. 2. Operations are very complex. 3. Size of batch are medium and large 	<p>1M</p> <p>1M</p> <p>(Any 2 points: 2 M)</p>



		<p>4. Labour cost for the component is high.</p> <p>5. The component requires 100 percent inspection.</p> <p>6. Batches are often repeated.</p> <p>7. Ratio of cutting time to non-cutting time is high.</p> <p>8. The component requires substantial tooling.</p> <p>9. A large variety of components are produced.</p>	
Q.6		Attempt any <u>FOUR</u> of following:	16 M
	a)	State working principle of liquid penetration and eddy current method of NDT and explain.	4 M
	Ans:	<p><u>Principle of Liquid Penetrant testing:</u> It is used in metals, plastics, glass and ceramics. It is characterized by the detection of the defects, which break the surface. Fluorescent penetrants are applied by dipping, spraying, brushing on the surface of the material to be tested. The penetrant is washed and a powder is applied to observe the penetrant remaining in cracks and revealing the flaws.</p> <p style="text-align: center;"><u>OR</u></p> <p>The main steps of liquid penetrant inspection are: Pre-cleaning: the test surface is cleaned to remove any dirt, paint, oil, and 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.</p> <p><u>Principle of Eddy Current testing:</u> It is characterized by detection of the surface and some sub-surface defects. It also helps to measure thickness of non-conductive coating. It is used in all the metals. It is useful for flaw detection, sorting by metallurgical properties such as hardness and thickness of measurement.</p>	<p>2M</p> <p>2M</p>
	b)	List and describe the technique used for recording results.	4 M
	Ans:	<p><u>Name of recording techniques-</u> 1. Lacquer film photography 2. Transparent tape recorder</p> <p><u>Explanation :</u> 1) Strippable Lacquer film:</p> <ul style="list-style-type: none"> 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. 	<p>(List:1M,)</p> <p>(Explanation : 3M)</p>



	<p>2) Transparent Tape Transfer:</p> <ul style="list-style-type: none"> 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. 	4M
c)	Explain the ISO codes of programming used in NC/CNC.	4 M
Ans:	<p>ISO Code: It is given by international organization for standardization.</p> <ul style="list-style-type: none"> It is 7 bit code Uses even parity In the first 4 channels, the numerical characters are used. It uses feed hole between track 3 & 4 For numerical data i.e. digit 0 to 9 a hole is punched in track 5 & 6 in addition to holes punched according to their binary equivalent. Alphabets A to Z are represented by punching hole in track 7 plus holes in ascending order of the binary count. The special character DELETE is represented by presence of the hole in all the tracks. 	(Any 4 points- 4M)
d)	Name four non-traditional machining. State its importance in industry.	4 M
Ans:	<p><u>Different nontraditional machining techniques are-</u></p> <ol style="list-style-type: none"> Electro discharge machining (EDM) Electron beam machining (EBM) Laser beam machining (LBM) Ion beam machining (IBM) Plasma arc machining (PAM) Abrasive jet machining (AJM) 	Any 4 non-traditional machining: 2 M



	<p>7. Ultrasonic machining (USM)</p> <p>8. Chemical machining (CHM)</p> <p>9. Electrochemical machining (ECM)</p> <p>10. Electrochemical grinding (ECG)</p> <p><u>Importance:</u></p> <ul style="list-style-type: none">▪ With the advancement of technology more and more challenging problems are faced by the scientists and technologists in the field of manufacturing .▪ The nontraditional machining techniques are therefore required to machine new materials and alloys with low machinability.▪ For producing complex geometry in such material like drilling holes and slots in glass and semiconductors,▪ Manufacturing complicated turbine blades made up of super alloy etc.▪ Machining of unusual and exotic materials are used.▪ High surface finish with high accuracy▪ High material removal rate.	(Any 2 points : 2 M)
e)	List properties of ultrasonic waves.	4 M
Ans:	<ul style="list-style-type: none">▪ The ultrasonic waves cannot travel through vacuum.▪ These waves travel with speed of sound in a given medium.▪ Their velocity remains constant in homogeneous media.▪ These waves can weld certain plastics, metals etc.▪ These can produce vibrations in low viscosity liquids.▪ The ultrasonic waves are reflected and refracted just like light waves▪ The frequency of ultrasonic wave is above 20 KHz.▪ Ultrasonic waves are used for detection of material defects, communication, medical fields, soldering, cleaning, welding, etc.▪ Ultrasonic waves can be generated by piezo-electric method, magnetostriction method, laser method, etc	(Any 4 points : 4 M)