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.

Q1 A) Attempt any three:

a) Enlist any four problems of traditional industries. State four advantages of modern industry.

Any four point 2 mks

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

Advantages of modern industry :- **any 4 points – 2 mks**

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) Describe NDT and state the NDT methods

Any two points 2 mks

NDT:

- NDT- non –destructive testing.
- NDT gives qualitative as well as quantitative information.
- The reliability of NDT is a measure of its efficiency in detecting different flaws and defects of different types, shapes and sizes.
- Non Destructive Testing is the technic of an object or material with technic that does not affect its future use fullness.

Method of NDT: 2 mks

Radiography**,** Ultrasonic testing**,** Magnetic particle testing**,** Liquid penetrant testing**,** Eddy current testing Acoustic Emission, holography, thermography, etc

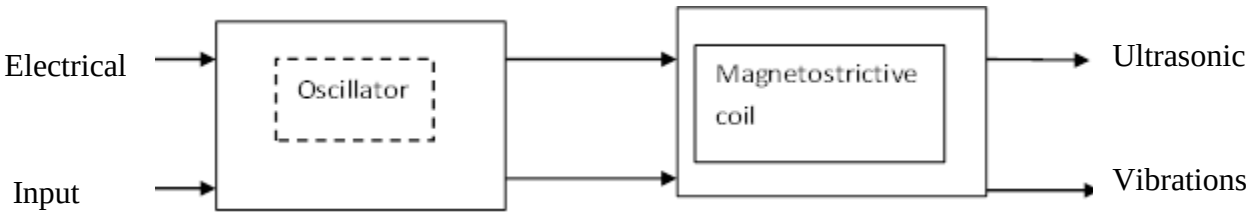
c) What is magnetostrictive effect? State the materials which exhibits this property (any two)

Statement: the magnetostriction effect: 3 mks

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. Generally the

change in the length is observed. The length may either increase or decrease. This change in the length is because of temperature; magnetization and the type of material used and 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 **1 mks**

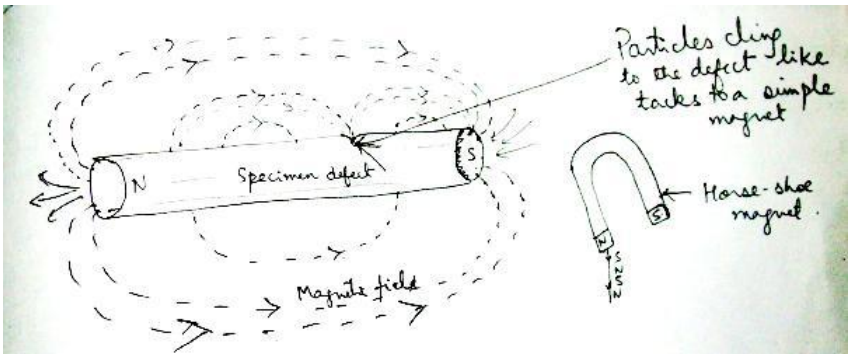


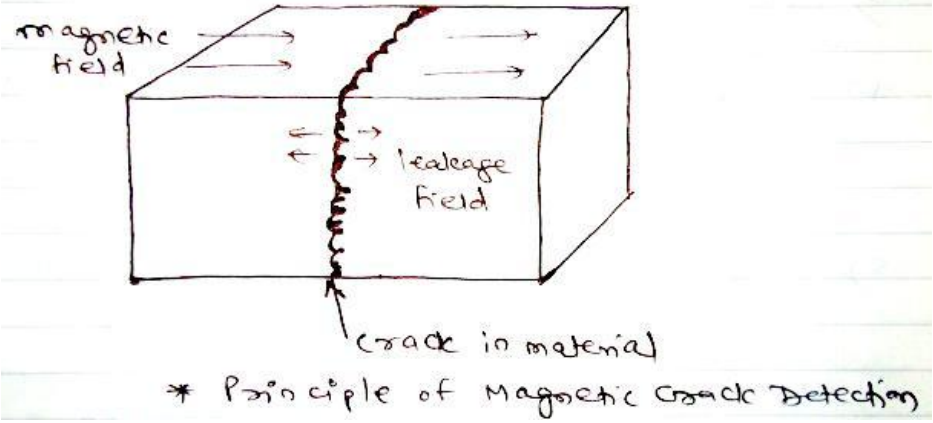
d) Describe the principle of magnetic particle testing.

The principle of magnetic particle testing: **3 mks**

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.

[*Note : any one diagram one mark]*





* Principle of Magnetic Crack Detection

B) Attempt any two

a) How parity checking is done in ISO and EIA codes. Explain ISO and EIA codes used for NC programming.

a) **ISO Code:-** **any 4 points- 2 mks**

It is given by international organization for standardization.

i. It is 7 bit code

ii. Uses even parity

iii. In the first 4 channels, the numerical characters are used.

iv. It uses feed hole between track 3 & 4

v. 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.

vi. Alphabets A to Z are represented by punching hole in track 7 plus holes in ascending order of the binary count.

vii. The special character DELETE is represented by presence of the hole in all the tracks.

EIA code :- **any 4 points- 2 mks**

It is given by electronic industries association.

i. It is a 7 bit code.

ii. It makes use of odd parity.

iii. Digits 1 to 9 are punched as their binary equivalent.

iv. Digit 0 is represented as equivalent of decimal 16.

v. For alphabets

A to I – track 6 & 7 are punched.

J to R – track 7 is punched.

S to Z- track 6 is punched.

vi. Delete is recognized by hole in every track.

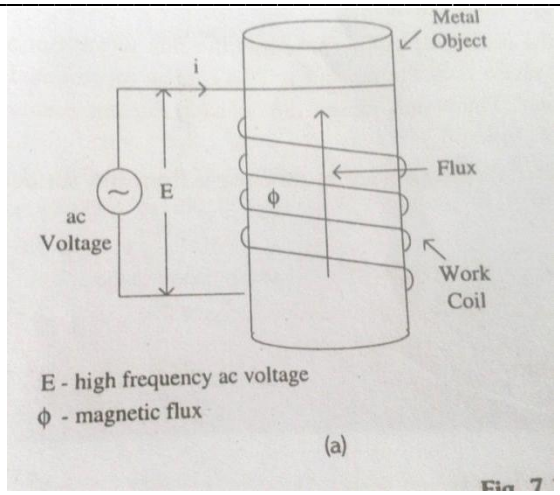
Parity checking- 2 mks

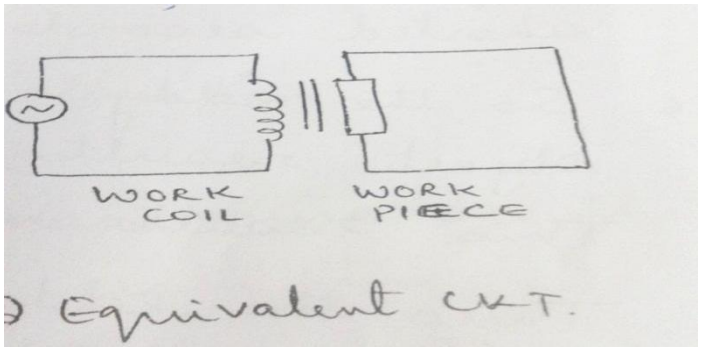
Parity for ISO is even parity and track eight track is reserve for parity check. It is also used for error checking to ensure that tape has been punched correctly. ISO code specifies even parity which means number of holes in the row should be even if the character code result in odd number of holes then hole is punched in parity track (track 8th) to make the number of holes even.
EIA code specifies odd parity and uses track 5th as parity check in similar way as ISO.

b) Draw the basic set-up of induction heating and write its working

Note: working 4 mks and diagram 2 mks

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.





Q2 Attempt any two

a) List the different methods of magnetisation. Explain in detail the longitudinal magnetisation method

Methods of magnetisation: **3 mks**

i. Magnetising using a horse-shoe magnet

ii. Using an electromagnet

iii. Contact current flow method

iv. Circular method of magnetisation

v. Longitudinal method of magnetisation

vi. Prod method

vii. Torroidal method

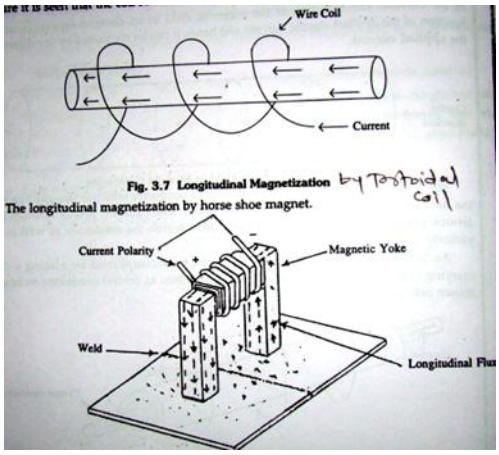
3 mks

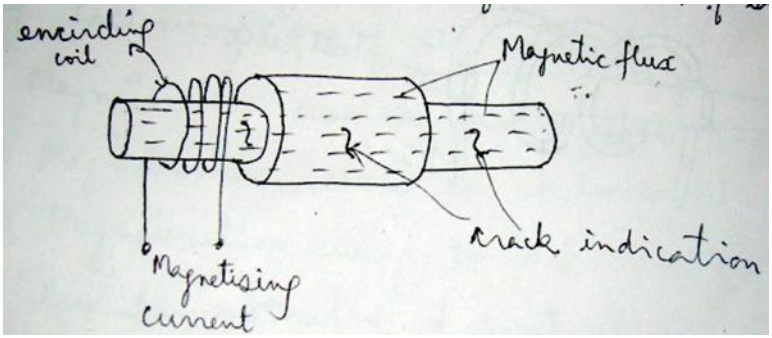
Longitudinal magnetization- it is used to detect the circular cracks i.e diameter wise cracks in the material. To produce the longitudinal magnetization the magnetizing current has to be passed in circular direction through the object. Or If a component is placed longitudinally within a coil carrying the current, the flux will be generated in the component giving north and south poles at its end.

Different methods of longitudinal magnetization are-

1. Tortoidal coil method- in this method the magnetizing current is passed through tortoidal coil wound around the object which then includes the magnetic lines in straight direction in the object.
2. Horse shoe magnet method- in this method the magnetizing current is passed through the coil wound the magnetic type which then induces longitudinal magnetic lines of forces.

[Note any 1 diagram 2 mks]





b) What are the different media used to input the information for NC machine. Explain in detail

a) **Different media used to input the information for NC machine**

Input medium is the programme of instructions, detailed step by step of directions which tell the machine tool what to do and in what sequence. **1 mks**

The part programme is written in the coded form and contains all the information needed for machining the components

The part program is fed to the machine control unit through some medium or storage devices like punched cards, punch tape, magnetic tape, floppy disk, etc. **2 mks**

i. Punch card is the most primitive input medium for NC machine. Nowadays, it is not widely used. Eg IBM punch card. **1 mks**

ii. Punch tape is made up of material like plastic or paper having dimensions of about one inch wide. It includes 8 tracs and can store character digit or any special character. The information is punched on the tape in the standard code like EIA or ISO **2 mks**

iii. Magnetic tape and disks are widely used in NC machine as they have large storage capacity. The data is stored in the coded form. The width of tape is 6mm or 25 mm magnetic disk on the floppy disk are circular in nature and made up of magnetic oxide. **2 mks**

c) Draw and explain the basic setup used for EDM.

4 mks

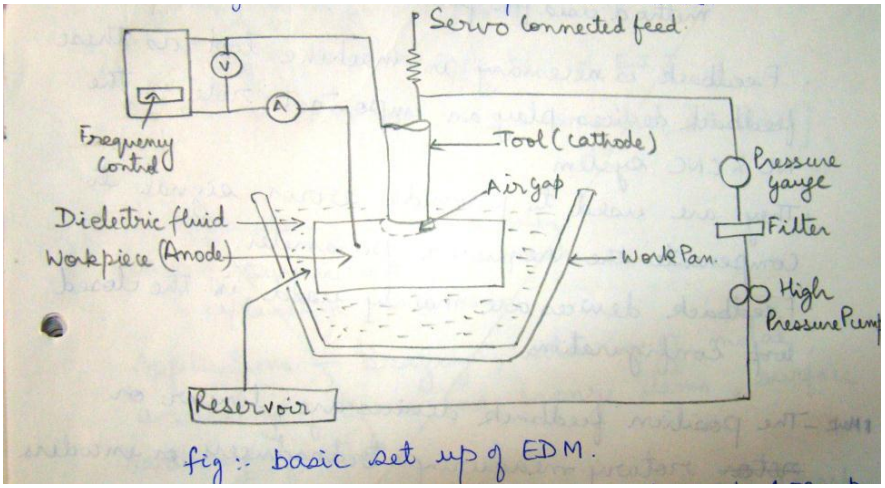


fig :- basic set up of EDM.

Operation:- **4 mks**

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.

Q3 Attempt any four:

a) Descirbe wet method and dry method used in MPT

Ans:- 2 mark each method

1) **Dry method:**

i) Dry particle inspection is well suited for the inspection which is on a rough surface.

ii) In this magnetic particle technology. Dry particles are dusted on to the surface of test object as the item is magnetized.

iii) Pulsating DC current creates a pulsating magnetic field that provides mobility of the power.

iv) Dry particle inspection is also used to detect sub surface cracks.

Wet method:

i) This method involves applying the magnetic particle while they are suspended in liquid carrier.

ii) Suspension is also available in dry so that the surface can be quickly and easily covered with uniform layer of particles.

iii) 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.

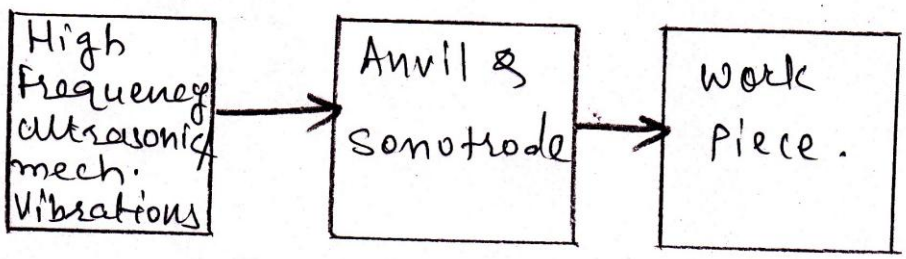
b) Explain with block diagram ultrasonic cold welding.

Ans: Cold welding: **3 mks**

In cold welding to in increase the temp and melt the material, the parts to be welded are not heated to melting point but are connected by applying pressure and high frequency mechanical vibrations. During ultrasonic metal welding a complex process is triggered involving static forces and a moderate temp increase in welding area.

The workpiece are placed between a fixed machine part i.e. the anvil & the sonotrode which oscillates horizontally during the welding process at high frequency.(usually 20 or 35 or 40 khz). The most commonly used frequency is 20khz.

1 mks



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

Ans: - **Any 4 points, 1 mark for each point**

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 odors.

7. It should be easily available in market at reasonable rate.

8. It should maintain its properties under all working conditions.

d) Explain the various probes used in UFD

Probes are classified as **1 mks**

1) Contact Probes

2) Immersion probes

Explanation **3 mks**

1) Contact Probes:

Contact probes are used for direct contact inspections and are generally hand manipulated coupling materials are used to remove or commercial materials are used to remove the air gap between the transducer and the component inspected.

2) Immersion probes:

These probes do not contact the component. These probes are designed to operate in a liquid environment. Immersion probes can be purchased with in a planner, cyclindrically focused or spherically focused lens.

Types of contact probes:

a) Dual element probes:

Dual element probe contain two independently operating elements in a single housing one of the elements transmits and the other receives.

b) Delay line probe:

Delay line probes provide versatality with a variety of replaceable options. As the name implies the primary function of delay line transduce is to introduce a time delay between the generation of sound wave and the arrival of any reflected waves.

3) Angle Beams probes:

Angle beam probes are used to introduce a refracted shear wave into the test material.

4) Straight beam or Normal Probes:

Probes whose beams are normal to the surface are called straight beam probes. They are most standard and receive longitudinal waves.

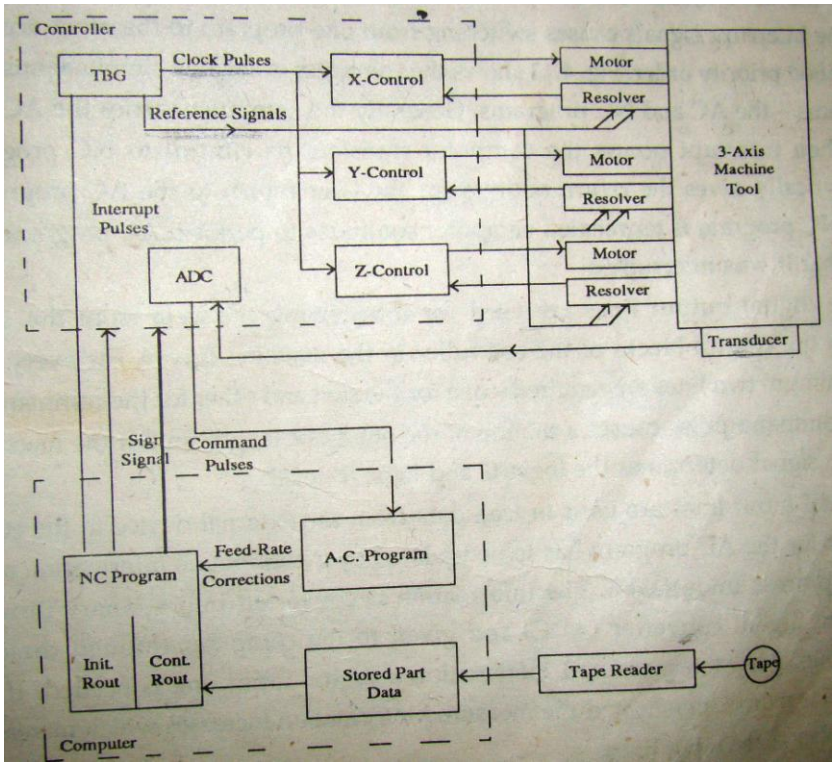
5) Paint brush Probes:

Paint brush probes are used to scan wide areas.

e) Draw the block diagram of CNC system. Describe its operation.

Ans: - **Block diagram: -**

2 mks



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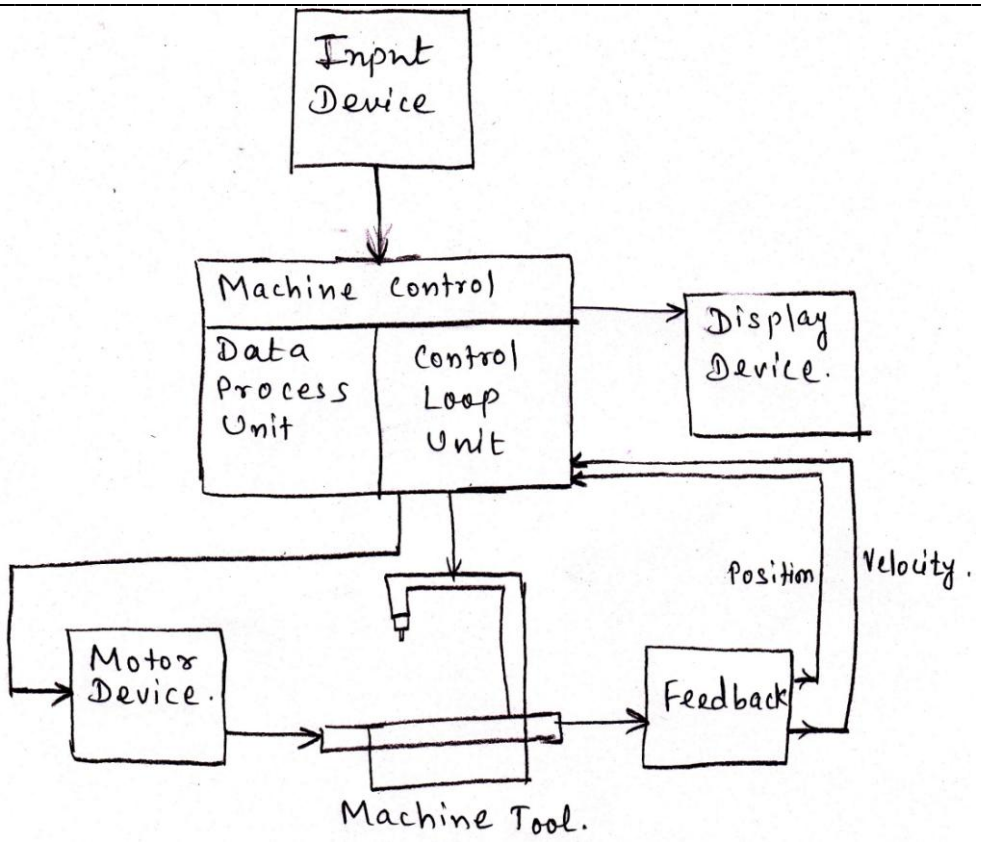


Block diagram consist of the following points: - **2 mks**

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:

1. Interrupt input line.

2. Digital output line.
3. Digital input line.

The interrupt pulses are generated by TBG and supplied to computer through interrupt line.

Q4 A) Attempt any three

a) State any four advantages and disadvantages of MPT.

Ans: - Advantages of MPT: - **2 mks**

1) MPT is a sensitive means of detecting very fine surface flaws and in certain situations it is superior to more sophisticated techniques in this respect.
2) It is also possible to obtain indications from discontinuities that do not break through the surface provided that they are close to the surface.
3) It is often necessary to have elaborated pre-cleaning routine and it is sometimes possible to obtain good indications even if flaw contains contaminating material.
4) The equipment is comparatively cheap.

Disadvantages of MPT: - (any four) **2 mks**

1) This technique is suitable only for ferromagnetic materials.
2) For the best result, the induced magnetic field should be normal to any defect; thus, two or more magnetizing sequences will be necessary.
3) Demagnetizing procedure will need to be carried out for many components after inspection.
4) When large components are to be inspected, extremely large currents are required and care will be needed to avoid localized heating and surface burning at the point of electrical contact.
5) Skilled and experienced operator is needed for correct interpretation of the significance of indication.
6) Sensitivity of MPT will be reduced if the component is covered by film of paint or other non-magnetic layer.

b) State the various types of electrodes used in EDM with their functions.

The purpose is to convey the electrical machining pules to allow the erosion of work piece and it is always electrically conductive material. **1 mks**

Electrodes are classified based on electrode material. **3 mks**

1) Metalic electrodes:

Electrolytic copper, tellurium or chromium, copper, copper tungsten, brass, steal, zinc& zinc alloys tungsten carbide and aluminium.

2) Non-metallic electrodes- Graphite

3) Combination of metallic & non-metallic materials-copper Graphite.

c) Describe in details computer Integrated Manufacturing.

Any 4 points means 4 marks

- 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.
- CAD provides the electronic part images and
- CAM provides the facility for toolpath cutters to take on the raw piece.
- CAD allows designers to create electronic images which can be displayed.
- CIM system improves capability of the component technology.
- It provides higher productivity.
- It also provides maximum flexibility, more reliable and saves time.

d) State and explain in brief the advantages of CNC machines.

Ans:

[Note: any four advantages 4 mks.]

Advantages of CNC machines are:

1) Reduced lead time:

The time between the receipt of a design drawing by the production engineer and manufacturer getting ready to start production on the shop floor, including the jigs etc. is called lead time. Since special jigs and fixtures are often eliminated in CNC machines, the time needed for their design and manufacture is saved

2) Elimination of operator error:

The machine is controlled by the program of instructions stored in the memory of the computer. The program is checked before it goes to the machines. So no errors will occur in the job.

Inattention by an operator will not affect the quality or duration of the machine.

3) Operator activity:

The operator is relieved of tasks readily performed by the machine.

4) Lower labour cost:

Actual cutting time in the CNC machines is more than conventional machines since the setting time etc. are lower. Also one operation can run two or more machines resulting in reduced labour cost.

5) Smaller Batches:

By the use of preset tooling and pre-setting techniques, down time between batches is kept at a minimum which is found to be economical

6) Longer tool life:

Tools can be used at optimum speeds & feeds because these functions are controlled by the part program.

7) Elimination of special Jigs & Fixtures:

Standard locating fixtures are often not used on CNC machines and cost of special Jigs fixtures is eliminated.

8) Flexibility in changes of component design

The changes in component design can be made by reprogramming instruction which save time and cost.

9) Less Scrap:

Since the operator errors are eliminated, a proven part programme results in an accurate component.

10) Reduced Inspection:

It is necessary to inspect the first component only so the time spend on inspection is reduced.

11) Accurate costing and Scheduling:

In CNC, the time taken in machining is predictable consistent are results in a great accuracy in estimating and more consistency in costing.

B) Attempt any one

a) Explain the steps involved in manual part programming

Ans: - Manual part programming is the procedure by which the sequence of processing steps is planned and documented.

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 mks**

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**.** **[1 mark]**

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**).** **1mks**

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)

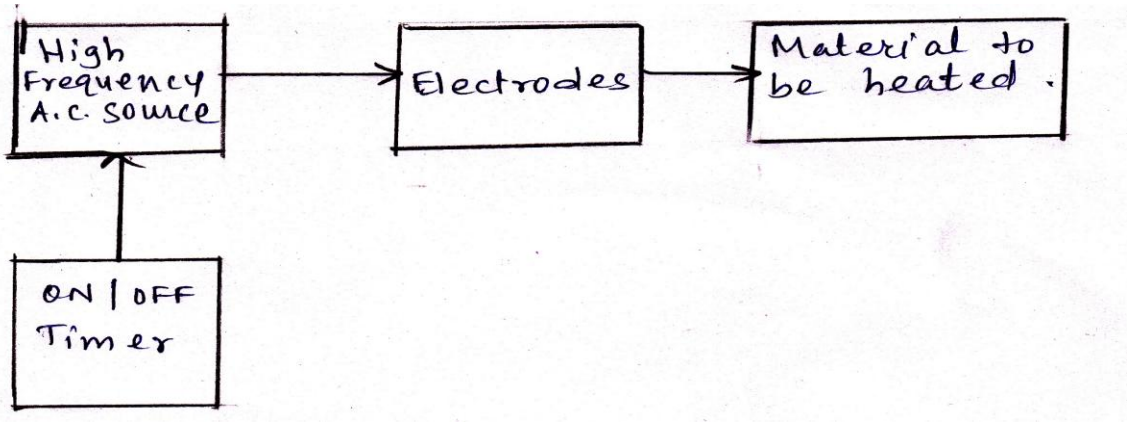
- The EOB symbol identifies the end of instructions block**.** **1 mks**

b) Explain the principle of dielectric heating with block diagram.

The principle of dielectric heating: **3 mks**

- The material to be heated is placed between two electrodes which may be two parallel plates across which high frequency voltage is applied. The material acts as a Dielectric between two elctrodes of capacitor.
- When capacitor is placed in electric field its molecules are subjected to stress are disturbed. 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. It is this power loss that is utilized in Dielectric heating.

Dielectric Heating diagram **1 mks**



Q5 Attempt any two:

a) Comparison between induction heating and dielectric heating. [8 point-8 marks]

Ans

Inductive heating	Dielectric heating
1. Used conducting materials	Used non-conducting or insulating materials
2. Based on the principle of induction and utilizes eddy current losses.	Used dielectric losses in material
3. It is surface phenomenon	Bulk phenomenon
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. Not economical but expensive	Economical
7. Efficiency is less	Efficiency is more than induction heating.
8. Applications: brazing, surface hardening of steel	Applications: in food industries like packaging of liquids products, packaging of medicines, wood items, etc

b) State and explain computer aided part programming

Ans:- (Introduction -3 marks, types of CAPP-1 mark and explanation of either APT or COMPACT II

4 mks

In the computer aided part programming the geometry of the product component is drawn. This geometry is spilt into simple element like points, lines, arcs, full circle, distance and direction and these elements of the component is defined using simple abbreviated english like P1 / 0, 0 (co-ordinates of point P1 are (0,0))

L1 / P2, P4 (line L1 passes through point P2 and P4)

Computer aided part programming languages are –

1. APT – Automatically programmed tools.
2. COMPACT II

1. **APT :-** most widely used and it is three dimensional system which can be used to control up to five axes.

- The work piece remains stationary and cutting tool does all the movements.
- There are four types of statements in APT like geometric, motion, post processor and auxiliary statements.

Geometric statements:- Geometric statements are also called definition statements and are used to define geometric element like point, circle, arc, plane etc.

Motion statement :- Motion statement are also called machine control instruction. The general format for APT motion statement is motion command / descriptive data.

Post processor statement:- Post processor statement are m/c specific and control the operation of the m/c spindle, feed rate and other feature of m/c tool like tool change etc.

Auxiliary statement:- Auxiliary statement are used for part identification, cutter size definition, defining the dimensional tolerance and other function to prepare the control system to accept and execute the part program.

2. COMPACT II:-

- A computer assisted part programme written using COMPACT II consists of a series statement which provides instruction to the m/c control system.

Initialization statement:- Initialization statement must come first in any programme. The Initialization statement usually includes four sub- statements. i.e .machine, identification, set-up and base statement.

Machine statement:- Machine statement is the first statement of the programme. It given information about the m/c tool.

The identification statement:-The identification statement is the second statement in the programme and is used to identify the part programme.

The set – up statement:-The set – up statement is the third statement in the programme. It is used to specify home position and absolute zero of the m/c tool.

The base statement:- The base statement is the fourth statement in the programme. It is used to established the base or co- ordinate system of the part for easier programme.

Geometry statement:- the space of the work piece is defined using the geometric elements. i.e. points, lines, circle, planes.

Tool change statement :- the Tool change statement contains all information relevant to machining. i.e. tool configuration, feed rate, spindle speed etc.

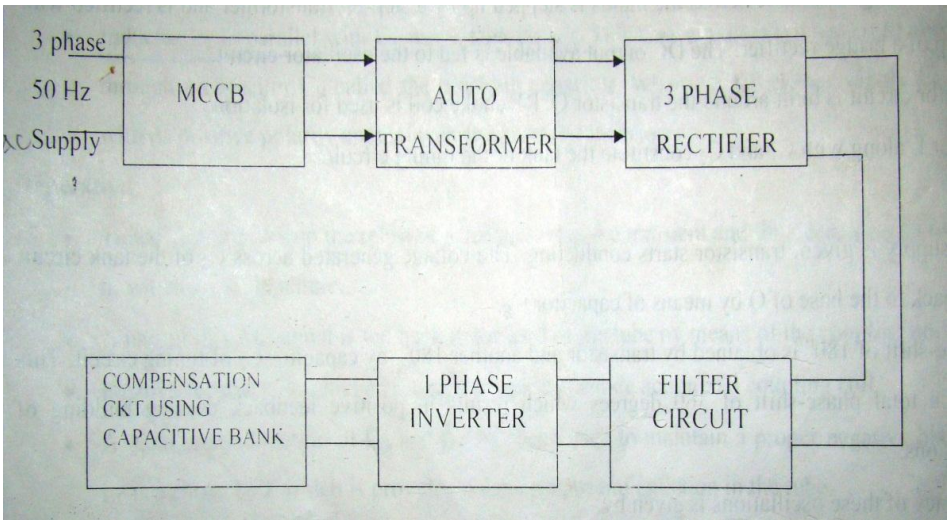
Motion statement:- Motion statements define the geometrical shape of the component. Major words are used to specify or identify whether the motion is linear or circular and the minor words specify and terminate the path of the tool.

Programme termination:- the programme is terminated by the major words END.

c) Draw and explain the circuit of high frequency power source used for induction heating.

Ans: - Block diagram of static Generator : -

4 mks



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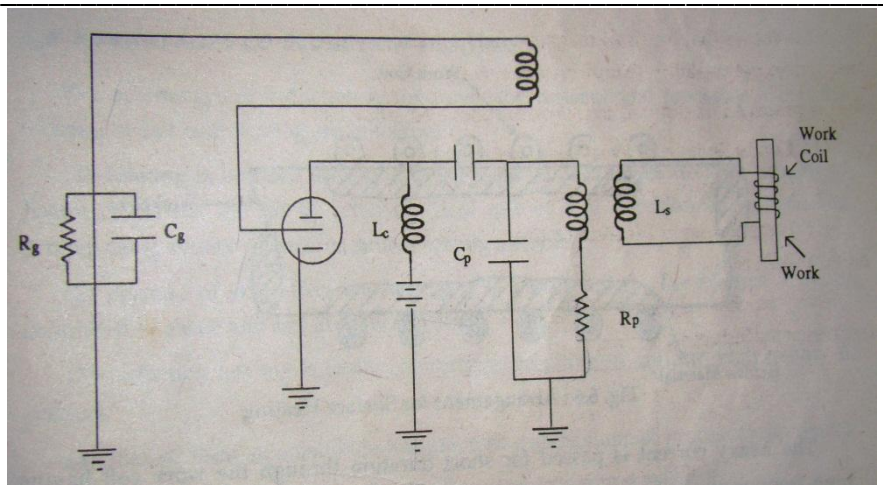


Explanation: - **4 mks**

The above fig. represents a simple block diagram of a static converter which converts three phase normal frequency power supply into a single phase power with higher operating frequency.

MCCB: - A 3 phase 50 Hz AC power is fed to a 3 phase rectifier through a Moulded Case Circuit Breaker (MCCB).the MCCB protects the converter from over current.

Auto transformer: - The exact voltage needed as input for the rectifier may be obtained from the auto transformer.

Three Phase Rectifier: - Power thyristors with water cooled arrangement are used to produce a fully wave 3 phase rectifier bridge.

Filter Circuit: - The 3 phase rectifier produces high voltage DC at its output which has a quite a lot of ripple content. The ripples are minimized by using an appropriate filter circuit.

Single Phase Inverter: - Ripple free high voltage DC is given as input to a 1 phase inverter circuit. Power thyristors with water cooled arrangement are used to produce fully controlled 1 phase Inverter Bridge.

Compensation Circuit: - The lagging effect of power factor introduced due to the inductor coils is compensated by the means of a compensating capacitor bank to make the power factor nearly one.

Q 6 a) What is part programming? Explain different code used in NC machine.

Ans: - **Part programming: -** **1 mks**

Part program is the set of instruction which instruct the machine tool about the processing steps to be perform for manufacturing of component.

Codes used in NC machine

i) **N-words** (Sequences Number): The first word in every block is sequence no. Sequence no is used to identify the block.The sequence no is preceded by word N and written as N 0001,N 0002.

ii) **Preparatory Function**(G words): Preparatory word prepares the control unit to execute the instruction that are to follow.Preparatory word is represented by two digits preceded by G eg. G 00, …….G 99.Like G01 dose the function Linear interpolation.Go0 – It is the preparatory code which prepares the control unit to execute the instruction to follow Rapid transverse**.**

iii) **Coordinates(X-, Y-, and Z- words**) : These word gives final coordinate position for X, Y, Z motion. In two axis CNC system only two coordinate woeds would be used.

iv) **Feed Function : (F words)**: Feed uction is used to specify the feed rate in machining operation. The Feed rate is expressed in millimeter per min.or rev/min. eg F200 means Feed rate is 200 rpm or 200 mm/min.

v) **Spindle Speed function(S**-word) : Spindle speed is also specified either in revolutions per min or mmpermin.If the machine is required to run at 800 rpm the speed will be specified as S 800.

vi) **Tool selection function (T**-word) : T-word is nedded only for machines with programmable tool.or automatic tool changer.(ATC).

vii) **MiscelleneousFunction(M-word):** Miscelleneous word is used to specify certain Miscelleneous or auxillaryfuction which do not relate to the dimensional moments of machine. Miscelleneous function may be spindle start ,spindle stop, coolent on /off etc. eg**M02**Programe stop**. M 06**toom change. M – it is a miscellaneous function word is used to specified certain miscellaneous or auxiliary function which do not relative dimensional movement of machine.Mo8 is used for operation Coolant ON.

viii) **End of block (EOB):** The EOB specifies th e end of instruction block.

[Note:, please consider equal weightage for EIA and ISO]codes

(**1 mark for any seven words specified above**)

b) Describe the methods of listing the coordinates of point in the NC/CNC machine.

Two coordinate systems are used to define and control the position of tool in relation to the workpeice, The coordinate system may be independently or may be CNC part programme according to machining requirement of the component.

Two coordinate systems used are

i) Absolute Co-ordinate System.

ii) Incremental Co ordinate System.(2 marks to state coordinate system)

Absolute Coordinate system: In thia system the coordinates of a point are always referred with reference to the same datum .The datum position in the X-axis , Yaxis, and Zaxis are defined by the user or programmer before starting the operation on the machine.a major advantage of using absolute system is that it is very easy to check and correct a programme written using this methos .If mistake is made the valued of any dimension in particular block, it will affect that dimension only and once the error is corrected there will be no further problem.

Incremental Co ordinate System: in the Incremental Co ordinate System of any point is calculated with reference to the previous point i.e the point at which the cutting tool is positioned is taken at datum point for calculating theoordinates of next point to which movement is to be made.It is difficult to check a part programme written in incremental dimension mode.

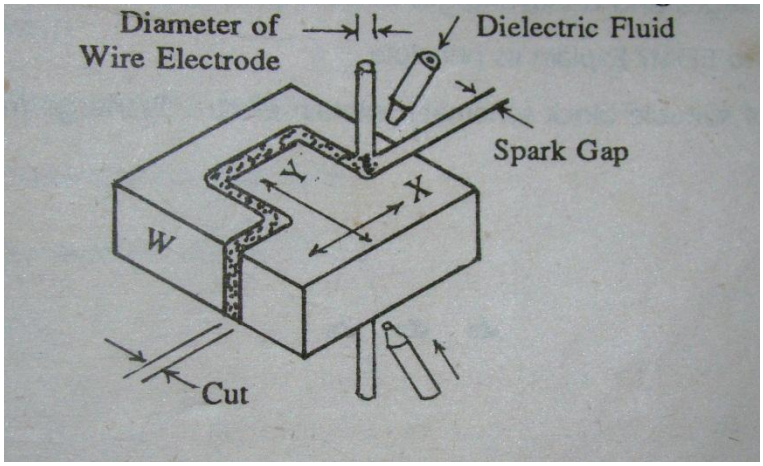
The diffence between these two system can be better appreciated with help of component shown .the coordinate of points P1, P2, P3, P4 in absolute and incremental system are given in table below

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

3 marks should be given to well explanation of each system

c) Draw a neat diagram of wire cut EDM. Describe its operation. State two advantage of EDM

Ans: - Diagram: - **2 mks**



Explanation: - **4 mks**

- 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..

Advantages of EDM:- **any 2 point – 2 mks**

i) High surface finish

ii) High material removal rate.

iii) High accuracy.

iv) Complex part can be machined.