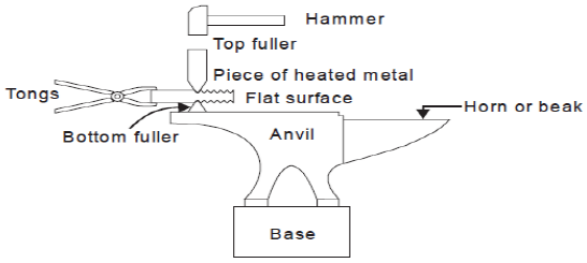
WINTER – 19 EXAMINATION

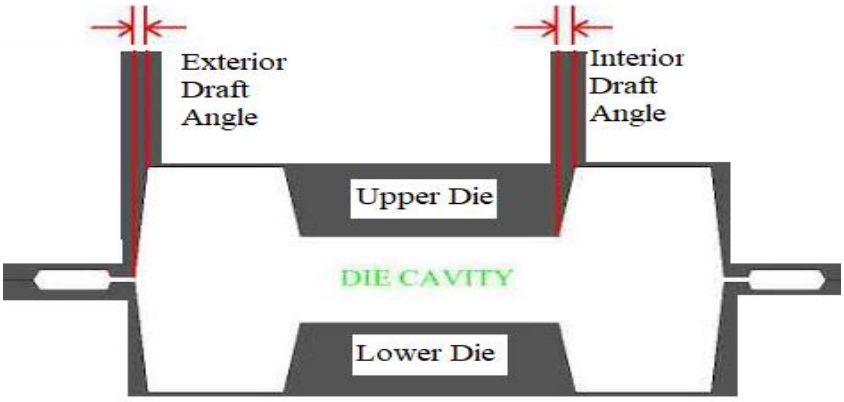
Subject Name: Auto. Mfg. Processes. **Model Answer** Subject Code: 17403

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*
1 (a)		**Attempt any SIX of the following:**	*12*
	i	**List the four hand tools used in forging.**	*02*
	Ans	**Hand Tools used in Forging:** 1. Hammer 2. Rigid Anvil 3. Hearth 4. Tong 5. Fuller  	*Any Four = 02 Marks*
	ii	**Enlist four press components used in automobiles.**	*02*
	Ans	**The various Pressed Products used in Automobiles are:** 1) Gears 2) Crank Shafts 3) Automobile panels 4) Wires 5) Frames and Chassis 6) Connecting Rods 7) Springs 8) Carburetor bodies 9) Valves 10) Combustion Chamber 11) Cylinder heads & blocks 12) Gear box cases etc.	*Any Four = 02 Marks*

	iii	**State four advantages of welding.**	*02*
	Ans	**Advantages of Welding Process:** 1) It produce permanent joint. 2) Large number of metals can be welded. 3) Freedom in design. 4) Strong and tight joining 5) Cost effectiveness 6) Simplicity of welded structures design 7) Welding processes may be mechanized and automated.	***Any four = 1/2 Marks Each***
	iv	**List four mechanical and chemical cleaning processes.**	*02*
	Ans	**Chemical Cleaning:** 1. Alkaline cleaning 2. Acid pickling 3. Electrolytic cleaning 4. Emulsified solvent cleaning 5. Vapour degreasing 6. Ultrasonic cleaning **Mechanical Cleaning:** a. Abrasive blast cleaning (Blasting) b. Tumbling c. Barrel rolling d. Power brushing e. Machine polishing & buffing	***Any four each = 01 Marks Each***
	v	**List applications of seam welding.**	*02*
	Ans	Seam welding is used to produce leak proof joint required in 1. Small Tanks, 2. Boilers 3. Containers, 4. Radiators 5. Heat Exchangers etc.	***Any Four ½ Mark Each***
	vi	**State the function of the programming code. (i) G01 (ii) G90**	*02*
	Ans	**(i) G01:** Linear Interpolation. **(ii) G90:** Absolute Programming.	***01 Mark Each***
	vii	**State four advantages of CNC machines over conventional machines.**	*02*
	Ans	**Advantages of CNC machines over conventional machines:** 1) Greater machine utilization. 2) Complex machining operations can be easily done. 3) It gives high degree of accuracy. 4) It requires less inspection. 5) It reduces scrap & waste. 6) It gives high production rate. 7) It has lower labour cost & tooling cost. 8) Elimination of operator error 9) It gives more operator safety. 10) It gives more operator efficiency. 11) It reduces space requirements 12) Flexibility in changes of component design. 13) Tool life gets increased. 14) Lead time is reduced. 15) Elimination of special jigs and fixtures. 16) Accurate costing & scheduling.	***Any four = 1/2 Mark Each***

	viii	**Explain the term 'Draft' related to forging.**	***02***
	Ans	**Draft —** The necessary taper on the side of a forging to allow removal from the dies; also applies to the die impression. Commonly expressed in degrees as the draft angle.  	***Fig. Or Expl. 02 Marks***
1 (b)		**Attempt any TWO of the following:**	***08***
	i	**State four advantages and limitations of forging.**	***04***
	Ans	**Advantages of Forging:** ***1. Strength:*** i. Forging reduces the failures. ii. High strength to weight ratio. iii. It can be able to withstand fluctuating stress caused by sudden shock loading. ***2. Metal Conservation:*** i. Practically there is no waste of metals. ***3. Weight Saving:*** i. Strong thin-walled parts may be produced without damaging important physical requirements. ***4. Machining Time:*** i. Reduces machining time for finishing operations of the products. ***5. Speed of Production:*** i. High rate of production is possible. ***6. Incorporation in Welded Structures:*** i. Parts can be welded easily due to fibrous structure. ***7. It maintains uniform and same quality all over parts*** ***8. It gives close tolerances.*** ***9. It gives smooth surface finish.*** ***10. Allows the metal to be displaced where it is needed.*** ***11. Minimum machine finish carried out on the components especially when it is forged in dies.*** **Limitations of Forging:** 1. High tool cost. 2. High tool maintenance 3. No cord holes. 4. Limitation in size and shape. 5. Heat treatment process increases cost of the product. 6. Brittle materials like cast iron cannot be forged. 7. Complex shape cannot be produced by forging. 8. Rapid oxidation of metal surface at high temperature wears the dies.	***Any four advantages ½ Mark Each*** ***&*** ***Any four limitation ½ Mark Eachh***

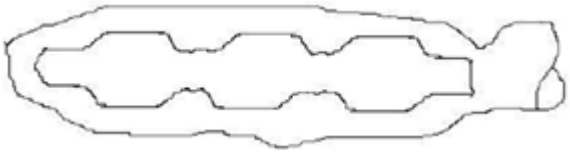
	ii	**Compare drop forging and press forging.**	*04*
	Ans	**Comparison of Drop Forging and Press Forging:**	*Any four = 01 Mark Each*

Drop forging	Press forging
1. This process involves **fast** squeezing of metal in dies by applying repeated blows by hammers.	1. This process involves **slow** squeezing of metal in dies by applying pressure.
2. The dies used relatively **more draft** and therefore more complicated shape cannot be forged.	2. The dies used relatively **less draft** and therefore more complicated shape can be forged.
3. Alignment of two dies is **difficult**.	3. Alignment of two dies is **easy**.
4. The life of machines and dies are **shorter**.	4. The life of machines and dies are **longer**.
5. This process **requires** highly skilled operator.	5. This process **does not** require highly skilled operator.
6. This process has **more** noise and vibrations.	6. This process has **less** noise and vibrations.
7. Production rate is **slower**.	7. Production rate is **faster**.
8. **Less** dimensional accuracy.	8. **Better** dimensional accuracy.

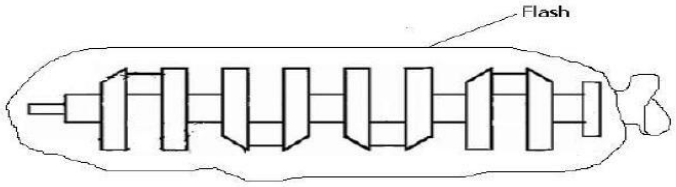
	iii	**Draw simple labeled sketch showing forging sequence for manufacturing Crank Shaft.**	*04*
	Ans	**Forging Sequence for Manufacturing Crank Shaft:**	*Any four steps =01 Mark Each*

[1] Stock is redistributed and size is increased at certain place and reduced at other place by roll forging.

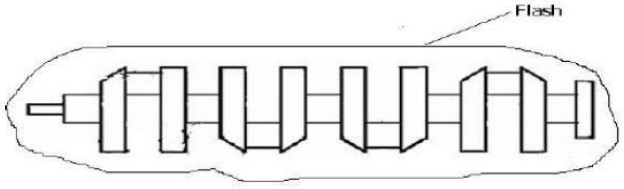
[2] After preliminary roll forging, stock is again roll forged.



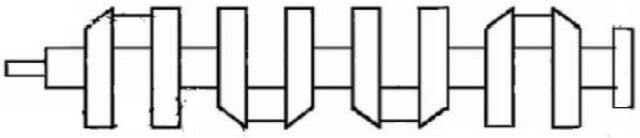
[3] This stock is then forged in first impression or blocking die.

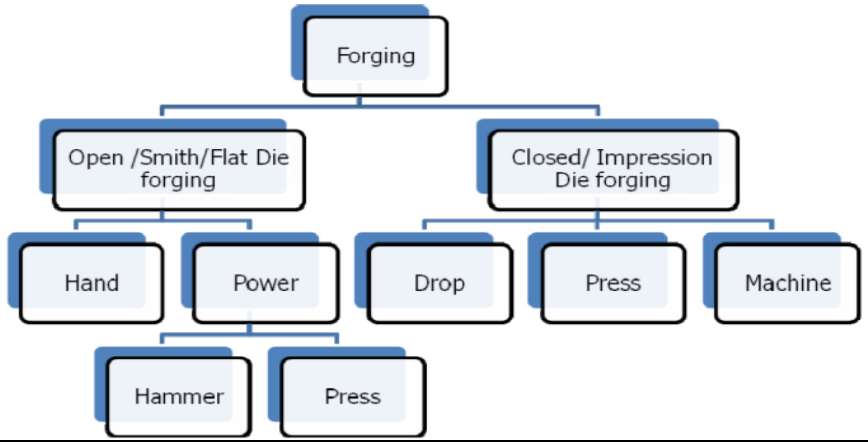
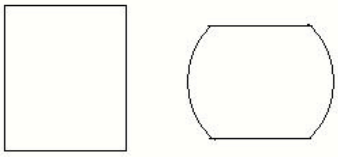
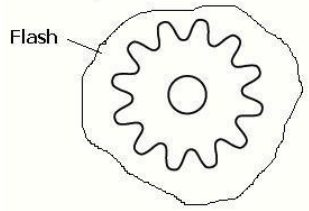
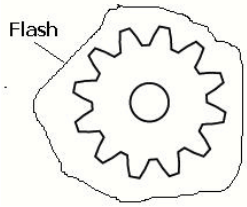


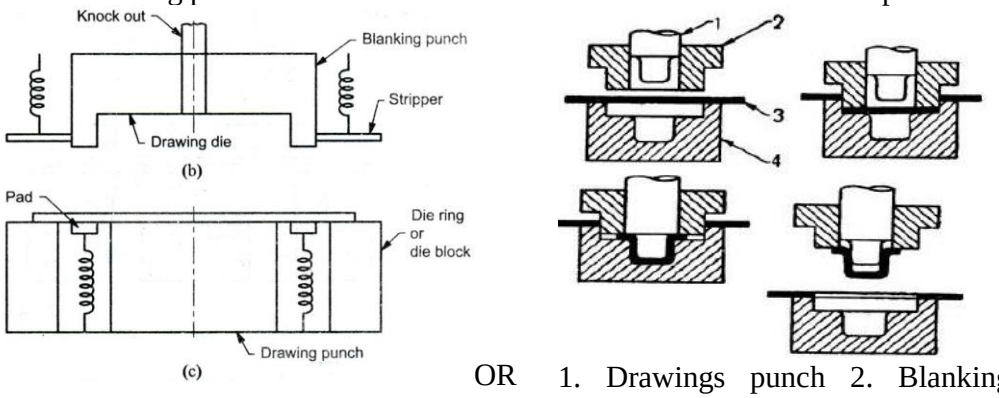
[4] The final shape is given to the forging in next blocking die.



[5] Then the finished part is then trimmed in blanking die to remove excess metal or flash.



2		**Attempt any FOUR of the following:**	***16***
	a	**Classify Forging processes.**	***04***
	Ans	**Classification of forging process -** **I. Open Die Forging:** (a) Hand forging (b) Power forging: i. Hammer forging ii. Press forging **Ii. Close Die Forging:** (a) Drop forging (b) Press forging (c) Machine forging **OR** 	***Correct Answer 04 Marks***
	b	**Draw the simple labeled sketches showing forging sequence for manufacturing Gears.**	***04***
	Ans	**Forging Sequence for Manufacturing Gears:** i) The size of the heated stock is reduced with compensation of its length i.e. Upsetting is carried out.  ii) After heading or upsetting, stock is forged in first impression die.  iii) Stock is forged in next impression or blocking die  iv) Then the finished part is trimmed in blanking die 	***Correct Answer 04 Marks***

	c	**Explain construction and working of Combination Die with neat sketch.**	***04***
	Ans	**Combination Die:** In this both cutting and non-cutting operations are performed at one station of the press in every stroke of the ram. Figure shows a combination of blanking and drawing die.In this cutting operation is combined with bending / drawing operation. In a blanking and drawing combination die first of all the blanking punch is actuated and it separates the blank from the strip and then it exerts sufficient pressure on the edges of the blank to serve as blank holder when the drawing punch descends and draws the blank into the desired shape.  OR 1. Drawings punch 2. Blanking punch 3.sheet metal 4.die **Figure : Combination Die**	***Constructio n And Working 02 Marks*** ***&*** ***Sketch 02 Marks***
	d	**Name four die accessories and write their functions.**	***04***
	Ans	**Die Accessories:** 1) **Stripper:** To remove scrap material from the punch as it cleans the die block. 2) **Pilots:** The pilot positions, the stock strip accurately and bring it into proper position for blanking and piercing operations. They act as guides during the piercing or blanking operations. 3) **Stops:** The stops are used for correct spacing of the sheet metal as it is fed below the punch to give the greatest output in given length of the plate. 4) **Knock out:** The function of knock out is to eject the finished components from the die cavity. 5) **Strip Feeder:** It is used for feeding the strip mostly in automatic operations. 6) **Pressure Pad:** It is used for drawing operation for maintaining flat surface of the cup.	***Any Four = 01 Mark Each***
	e	**Specify a Press Size required for sheet metal work.**	***04***
	Ans	**Specification of Press Size:** **Shut Height**- The space available between the press bed or bolster and the slide or ram is called the shut height. It is always measured with the press shut or at bottom dead center. It may be specified as the vertical space between the ram and either the top of the bed or bolster **Bed and Bolster**- The bolster adds stiffness to the press bed and has tapped holes, or preferably T-slots, to permit the die to be fastened in the press. T-slots permit dies to be changed quickly and fastened in the press more securely than tapped holes. **Press Frame Members**-The strength of the parts that make up the framework or housing of presses determines the force capacity of the machine. Heavy frames limit deflection and help damp harmful vibrations. **Brake**-The friction mechanism used to stop or control the motion of a press, feed or other mechanism. Brake stopping time must be monitored in MS / milliseconds to assure that the press slide stops within a safe acceptable limit. **Clutch** -A coupling used to connect or disconnect a driving machine-member, such as a shaft or wheel, to or from a driven machine-member, such as another wheel or shaft. The engaging or disengaging can be done by a hand operated controlling device operated manually or automatically.	***Any Four 01 Mark Each***

Flywheel -A wheel used on an engine or machine with a rotation energy or inertia able to prevent excessive or sudden changes in speed. In modern mechanical presses the flywheel is usually driven by multiple belts from the main motor pulley to the flywheel. A clutch is mounted on or within the flywheel which, when engaged starts slide movement

Stroke-The reciprocating motion of a press slide, usually specified as the number of inches between the terminal points of the motion. Stroke length relates to speed ranges, the longer the stroke the slower the press speed range.

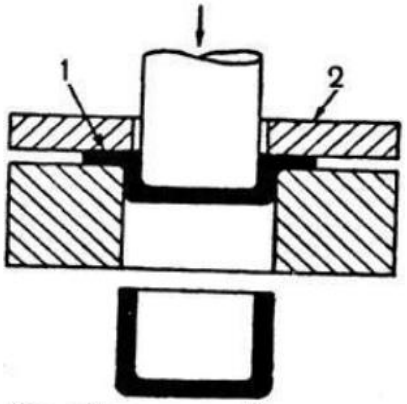
f **Explain drawing operation on press with neat sketch.** ***04***

Ans

Drawing Operation:

1. The drawing is the operation of production of cup shaped parts from flat sheet metal blanks by bending and plastic flow of the metal.
2. The blank is placed on die and while punch descend, the pressure pad holds the blank firmly on the die.
3. As the punch descend further, the blank is pushed in the cavity of the die and the metal is made to flow plastically while it is drawn over the edges to form sides of the cup. The operation is also known as cupping.
4. In this, clearance between punch and die is greater.

The drawing operation is illustrated in Fig.



Drawing operation

1. Blank, 2. Pressure pad.

Explanation 02 Marks & Sketch 02 Marks

3 **Attempt any FOUR of the following:** ***16***

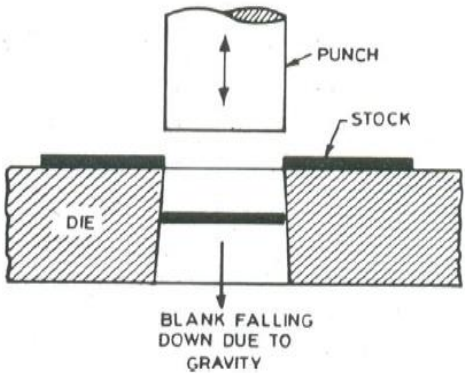
a **Explain Blanking operation on press with neat sketch.** ***04***

Ans

Blanking Operation:

1. It is the operation of cutting of flat sheet to the desired shape.
2. The metal punched out (i.e. blank) is the required product & the plate with hole left on die goes waste.
3. The die used for banking is called as blanking dies.
4. The size of blank is governed by size of die and the clearance left on the punch.

Fig. shows blanking operation



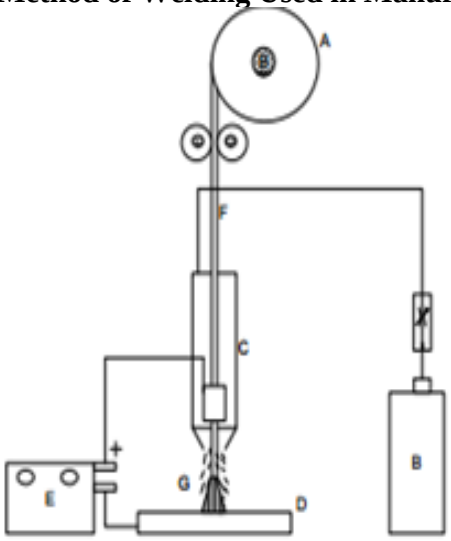
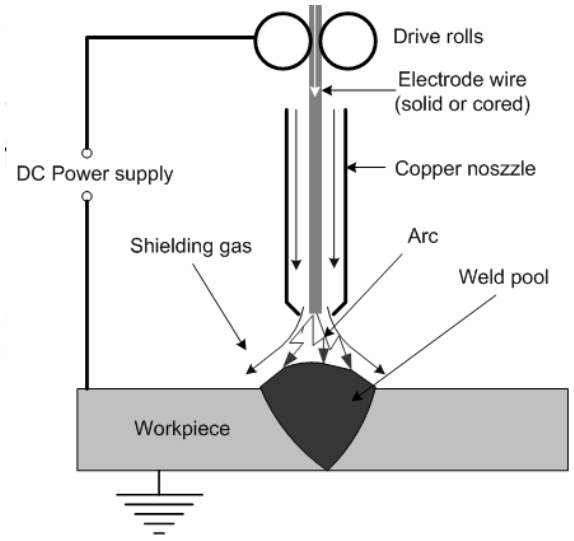
Explanation 02 Marks & Sketch 02 Marks

b **Compare Brazing and Soldering on the basis of :**
(i) Temperature Used. (ii) Filler Material. (iii) Joint Strength (iv) Applications. ***04***

Ans **Comparison of Brazing and Soldering:**

Point	Soldering	Brazing
Temperatures used	below 470°c	above 470°c.
Filler material	Solder.	Spelter.
Joint strength	Weak or less	More or strong.
Applications	Connections of radio & T.V. sets, wiring joints in electric connections & battery terminals, Radiator brass tube, copper tubing, Brass halved bearings etc.	Parts of bicycle such as frames & rims, Exhaust pipe in motor engine, band saw, tipped tool, pipe joints subjected to vibration etc.

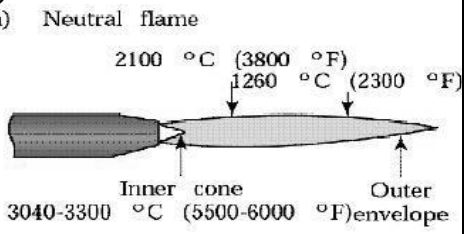
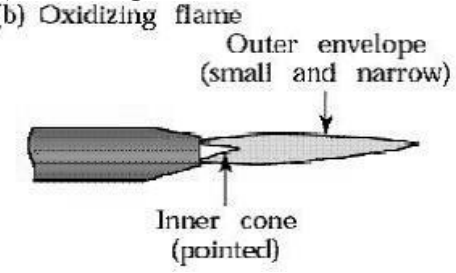
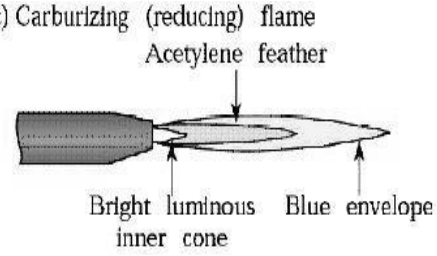
01 Mark For Each Correct Point

	c	**Explain with neat sketch method of welding used in manufacturing sheet metal roofs and doors of automobiles.**	***04***
	Ans	**Method of Welding Used in Manufacturing Sheet Metal Roofs and doors of automobiles:**  **OR**  **MIG Welding:** Gas-metal-arc welding is a gas shielded metal arc welding process which uses the high heat of an electric arc between a continuously fed, consumable electrode wire and the material to be welded. Metal is transferred through protected arc column to the work. In this process, the welding machine is a D.C. constant voltage which at a given wire feed rate will produce necessary current to produce arc. The wire is fed continuously from a reel through a gun to constant surface which imparts a current upon the wire. The welding gun is either air cooled or water cooled depending upon the current being used. The fused electrode material is supplied to the surfaces of the work pieces, fills the weld pool and forms joint. The welding area is flooded with a gas (an inert gas i.e. Argon, helium, CO2, argon + Oxygen or other gas mixtures) which will not combine with metal. Carbon dioxide is most commonly used as it inexpensive.	***Explanation 02 Marks*** ***&*** ***Sketch 02 Marks***
	d	**Classify welding processes.**	***04***
	Ans	**Classification of Welding Process** **Depending on method of heat generation American welding society classifies welding as** **A. Arc Welding** 1) Carbon Arc Welding; 2) Shielded Metal Arc Welding (SMAW) 3) Submerged Arc Welding (SAW) 4) Metal Inert Gas Arc Welding (MIG, GMAW) 5) Tungsten Inert Gas Arc Welding (TIG, GTAW) 6) Electroslag Welding (ESW) 7) Plasma Arc Welding (PAW) **B. Resistance Welding (RW)** 1) Spot Welding (RSW) 2) Flash Welding (FW) 3) Resistance Butt Welding (UW) 4) Seam Welding (RSEW) **C. Gas Welding (GW)** 1) Oxyacetylene Welding (OAW) 2) Oxyhydrogen Welding (OHW) 3) Pressure Gas Welding (PGW) **D. Solid State Welding (SSW)**	***Any Four = 01 Mark Each***

1) Forge Welding (FOW)
2) Cold Welding (CW)
3) Friction Welding (FRW)
4) Explosive Welding (EXW)
5) Diffusion Welding (DFW)
6) Ultrasonic Welding (USW)
E. Thermit Welding (TW)
F. Electron Beam Welding (EBW)
G. Laser Welding (LW)

e **List types of welding flames used in Oxy-acetylene welding. Write their characteristics and applications.** ***04***

Ans

Types of Flames:	Characteristics	Applications.
1)Neutral Flame: 	When oxygen and acetylene are supplied to the torch in nearly equal volumes, a neutral flame is produced. It has two definite zones - A sharp brilliant inner cone, An outer cone or envelop of bluish colour.	Steel, stainless steel, cast iron and aluminium
2)Oxidizing Flame: 	An oxidizing flame is one in which there is an excess of oxygen. The flame has two zones- the smaller inner cone which has purplish tinge, the outer cone or envelop.	Copper base metal like Brass & bronze, zinc base metal, a few types of ferrous metal such as manganese steel and cast iron.
3)Carburizing Flame or Reducing Flame: 	A carburizing flame is one there is an excess of acetylene. The flame has three zones 1) Sharply defined inner cone 2) An intermediate cone of whitish colour. 3) Bluish outer cone	High Carbon Steel, non - ferrous alloys,

Characteristics 02 Marks

And

Application 02 Marks

f **Sketch and explain a progressive die used to make washer.** ***04***

Ans

Progressive Die:

In a progressive die two or more operations are performed simultaneously at two or more stations with each press stroke by mounting separate sets of dies and punch. The metal is progressed from one station to other. Figure shows progressive punching and blanking die. The sheet metal is fed into the first die where a hole is pierced by piercing die set in first cutting stroke of ram. The plate is then advanced in next station. In the second stroke of ram the pilot enters into the pierced hole and correctly locate it while the blanking punch descend and shear the plate to form a washer

Explanation 02 Marks

&

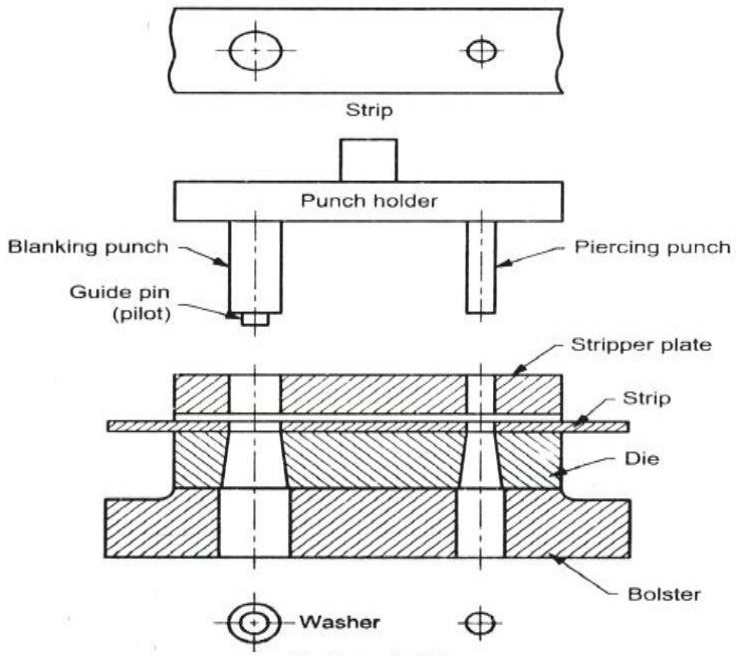


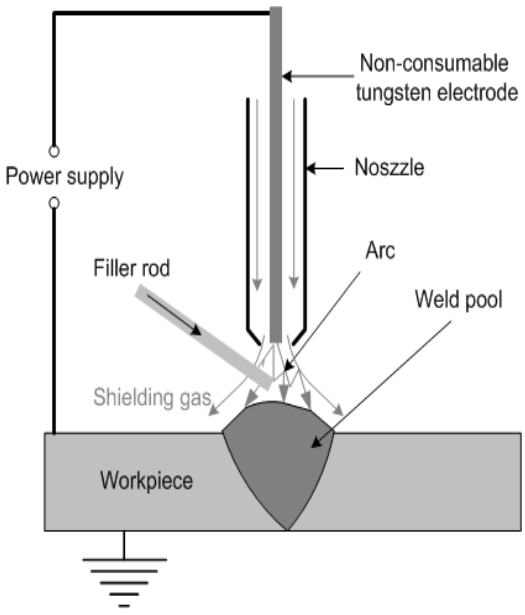
Fig:-Progressive Die

Sketch 02 Marks

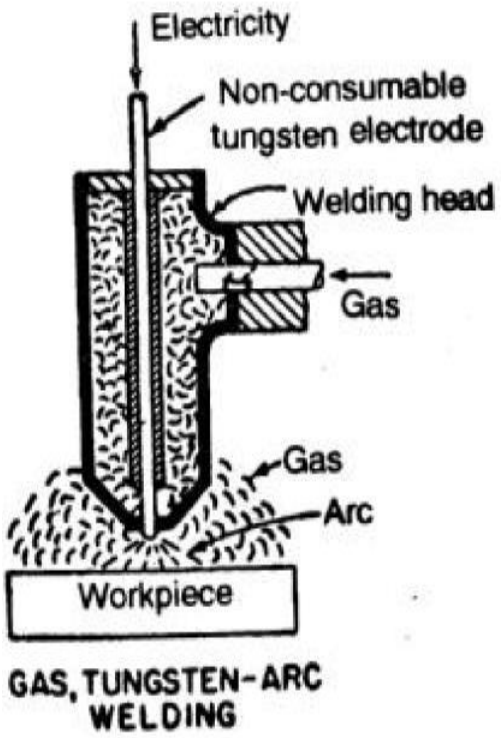
4		**Attempt any FOUR of the following:**	***16***
	a	**Explain TIG (GTAW) welding process with neat sketch.**	***04***
	Ans	**Tungsten Inert Gas Arc Welding (TIG, GTAW):** It is a welding process, in which heat is generated by an electric arc struck between a non-consumable tungsten electrode and the work piece. The weld pool is shielded by an inert gas (Argon, helium, Nitrogen) protecting the molten metal from atmospheric contamination. The heat produced by the arc melts the work pieces edges and joins them. Filler rod may be used, if required. Tungsten Inert Gas Arc Welding produces a high quality weld of most of metals. Flux is not used in the process.	***Explanation 02 Marks*** ***&*** ***Sketch 02 Marks***

Tungsten inert gas arc welding

(TIG, GTAW)

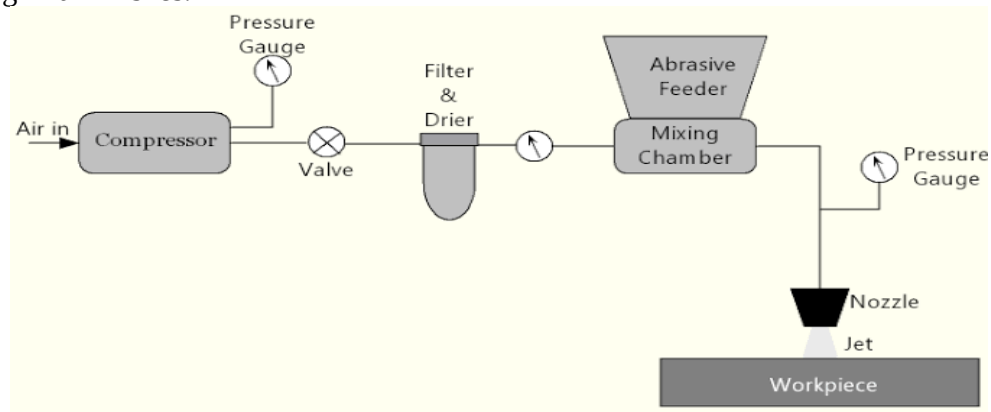


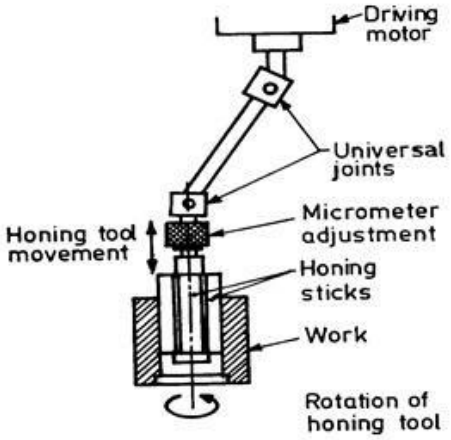
OR



	b	**Compare Electroplating and Galvanizing.**	***04***
	Ans	**Comparison of Electroplating and Galvanizing process:**	***Any four points = 01 mark each***

Electroplating process	Galvanizing Process
1) In this the steel is immersed in an aqueous bath, and electricity is used to induce anodes to dissolve in the aqueous solution, transport the ions, and electroplate them onto the work.	1) In galvanizing the work is immersed in molten zinc. As it is withdrawn, the zinc cools and forms a coating of zinc on the work
2) Electroplating coatings are almost always several times thinner	2) Galvanized coatings are almost always several times thicker
3) Electroplated zinc coatings can be smooth and shiny, and preferable for aesthetic reason	3) Galvanizing may be spangled, or gray and drippy.
4)Less corrosion resistant as compared with galvanizing	4)More corrosion resistant
5) Electroplating is thin and usually does not cause any problems with fasteners	5) Galvanized coatings are heavy and will interfere with fastener threads unless they are specially dimensioned to take the coating into account
6) Electroplated zinc coatings are not often adequate for direct outdoor exposure. i.e. applicable to indoors in dry climate	6) Galvanized coatings are up to 10x as thick and applicable to outdoor or more wet climate
7) The cost should be significantly lower than the cost of hot dip galvanizing	7)Cost is more as it is significantly thicker

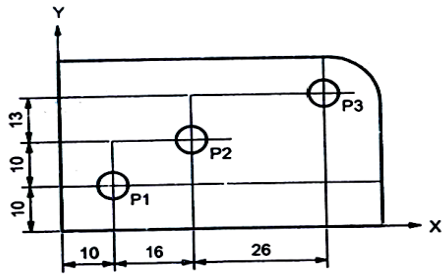
	c	**Describe Abrasive blast cleaning process with neat sketch.**	***04***
	Ans	**Abrasive Blast Cleaning (Blasting):** This method is widely used for removing all classes of scale and rust from forgings, castings, weldments, and heat treated parts. Depending on the finish requirements, blasting alone or blasting with pickling is used. In this process the parts are generally cleaned by the use of abrasive particles such as sand, steel grit or shot impelled against the surface to be cleaned. Some cleaning is performed by means of high-velocity air blast, with the blast directed by hand. In many cases, an airless blast machine that cleans by impact is also used. The abrasive is fed from an overhead storage hopper to the center of a radially rotating wheel, whereupon the metallic shot or grit is thrown in a controlled stream upon the work to be cleaned. All traces of sand, scale, oxides and other material are removed, providing an excellent surface for bonding final finishes.  	***Explanation 02 Marks*** ***&*** ***Sketch 02 Marks***

	d	**Explain micro finishing process used to correct hole geometry in component.**	***04***
	Ans	**Honing Process (micro finishing process):** To correct hole geometry in component, honing is used as a micro finishing process. Honing is an abrading process used mainly for finishing round holes by means of bonded abrasive stones called hones. Honing is primarily used to correct out of roundness, taper, tool marks and axial distortion. Abrasives used in honing are Silicon carbide, aluminium oxide, diamond or cubic boron nitride. When honing is done manually; the honing tool is rotated and workpiece is passed back and forth over the tool. Length of motion is such that the stones extend beyond the workpiece surface at the end of each stroke. For precision honing, the work is usually held in a fixture and the tool is given a slow reciprocating motion as it rotates (shown in Fig.). The stones are thus given a complex motion as rotation is combined with oscillatory axial motion. These two motions combine to give a resulting cross-hatch lay pattern. Honing stones may be held in the honing head by cementing them into metal shells, which are clamped into holder or they are cemented directly into holders. Coolants are essential to the operation of this process, to flush away small chips and to keep temperatures uniform.  **Fig.** Honing.	***Explanation 02 Marks*** ***&*** ***Sketch 02 Marks***
	e	**Name four component of CNC machine and write their functions.**	***04***
	Ans	**Components of CNC machines The various components of CNC system are :-** **1) Program Input Device:-** It is the medium of transmitting the part program to the computer. Three commonly used program input devices are punch tape reader, magnetic tape reader and computer. **2)Memory Storage :-**The control program as well as manual instructions are stored in the memory storage **3)Microprocessor :-** It reads the instructions given by memory storage & sends the required signals to the CNC machine tool **4) Machine Control Unit (MCU):-** It processes the information received from memory unit, operate and sends appropriate instructions to machine tool. **5) Drive System:-** A drive system consists of amplifier circuits, drive motors, and ball lead-screws. The control signals are augmented to actuate drive motors which in turn rotate the ball lead-screws to position the machine table. **6) Machine Tool: -.** It always has a slide table and a spindle to control of position and speed. The machine table is controlled in the X and Y axes, while the spindle runs along the Z axis. **7) Feedback System:-** It continuously monitor the position at which the cutting tool is located at any particular instant. **8) Programmable Logic Controller (PLC) :-**They developed to be re-programmed without hardware changes when requirements were altered and thus are re-usable. **9) Machine Control Panel:-**It is the direct interface between the operator and the NC system, enabling the operation of the machine through the CNC system.	***Any Four components = 02 Marks & Function = 02 Marks***

		10) Operator Control Panel:-The Operator Control Panel provides the user interface to facilitate a two way communication between the user, CNC system and the machine tool.	
	f	**Classify CNC machines.**	***04***
	Ans	**Classification of CNC machines. A. According to control loop feedback system:** 1) Open – loop system 2) Closed – loop system **B. According to type of tool motion control system:** 1) Finite positioning control system: a) Point – to – point system b) Straight cut system 2) Continuous path system: a) Two axes contouring b) Two & half axes contouring c) Three axes contouring d) Multi – axis contouring **C. According to programming methods:** 1) Absolute programming method 2) Incremental programming method **D. According to type of controller:** 1) NC based controller system 2) CNC based controller system	***Any Four = 01 Mark Each***
5		**Attempt any FOUR of the following:**	***16***
	a	**Differentiate between CNC and DNC machines.**	***04***
	Ans	**Differentiate between CNC and DNC machines:**	***Any four points = 01 mark each***

S. N.	CNC	DNC
1	In CNC, Far off controlling of operation is not possible	DNC facilitates far-flung control
2	CNC is a vital section of the machine.	DNC is not crucial to machines; DNC pc can come across at a distance from devices.
3	CNC is transferring machining instruction	DNC control the information distribution to a wide variety of machines.
4	CNC pc manipulates one NC machine.	Using DNC programmer can manage more than one NC laptop as required.
5	CNC has low processing power when compared to DNC	DNC have high processing energy when compared to CNC
6	CNC software is to enlarge the capacity of the precise computing device tool.	DNC now not only controls the equipment; however, also serves as a part of administration statistics system.

	b	**Describe incremental programming method with suitable example.**	***04***
	Ans	**Incremental programming method-** In Cartesian co–ordinate geometry system using incremental measurement. Each point is always specified using the path differential from the preceding point position. So in such a programming, controller must store & process additional path measurement, as shown in fig. It is a system in which the reference point to the next instruction is the end point of the preceding operation. Each data of applied to the system as a distance increment, measured from preceding point.	***Description 02 Marks & Example 02 Marks***



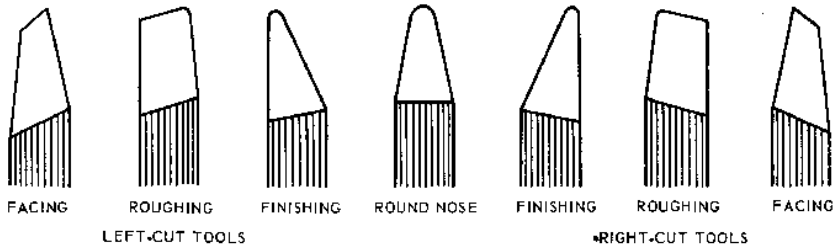
Point	X	Y
P1	10	10
P2	16	10
P3	26	13

c **Name the various tools used in CNC turning centre. Explain any one in detail.** ***04***

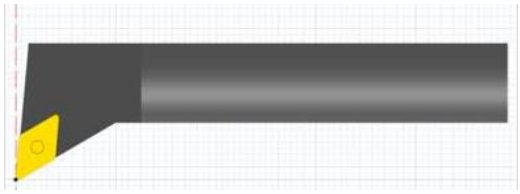
Ans

Tools used on Turning Centre:

1. **External Turning Tools:**

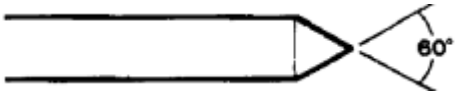


2. **Boring Bars**:



3. **Drills:**

4. **Threading Tools**:



5. **Parting Tools:**

List 02 Marks & Explain. Or Sketch of Any One 02 Marks

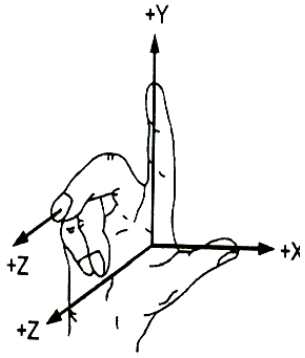
A. On the Basis of Cutting Tool Construction:
(a) Solid tools. (b) Brazed tools.(c) Inserted bit tools.
B. On the Basis of Cutting Tool Material:
(a) High speed steel (HSS). (b) High carbon tool steel (HCS). (c) Cast alloy. (d) Cemented carbide. (e) Ceramics. (f) Boron Nitride. (g) Diamond.

d **Explain any four reference position used on CNC machines.** ***04***

Ans

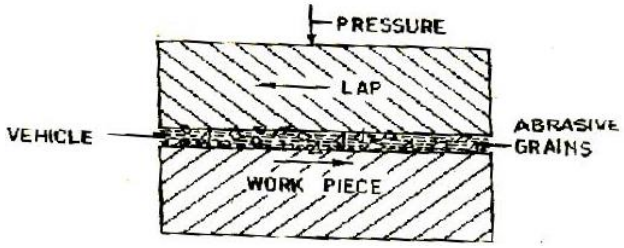
Reference Positions used on CNC Machine:
There are Four reference positions on CNC machine:
1. Machine zero point
2. Work zero point
3. Tool home position.
4. Parking Position

01 Mark Each

		1. Machine Zero Point: At this point coordinates of all axes are zero. Tool moves with respect to this point and position of all axes can be seen on computer screen. Machine zero point is decided by manufacturer of machine. **2. Work Zero Point:** For preparing a program, first tool path is prepared according to operation sequence and then coordinates of all points are determined. These coordinates are determined by considering an original point on the job where all the axes intersect and coordinates of that point are zero. This original point is known as work zero point. **3. Tool Home Position:** Tool is placed away from work zero point as well as machine zero point for sake of safety of tool, job and machine. The tool is changed only at home position. **4.Parking Position:** Parking position at the end of a job. This is generally used in situations where the operator wants the machine to move out of the way (usually to the back of the machine) after a job has completed.	
	e	**Draw and explain axis configuration as per ISO, for horizontal spindle CNC machines.**	***04***
	Ans	**Axis Configuration for Horizontal Spindle CNC Machines:**  The first axis to be identified is the Z axis. This is then followed by the X and Y axes respectively. **Z Axis and Motion:** **Location:** The Z axis motion is either along the spindle axis or parallel to the spindle axis. In the case of machine without a spindle such as shapers and planers, it is identified as the one perpendicular to the work holding surface, which may or may not be passing through the control point (e.g. the cutting tool tip in case of shaper). **Direction:** The tool moving away from the work holding surface is designated as positive Z direction. This means during machining tool moves in negative Z direction. **X Axis and Motion:** **Location:** It is perpendicular to the Z axis and should be horizontal and parallel to the work holding surface wherever possible. **Direction:** When looking from the principal spindle to the column, the positive X is to the right. For turning machines it is radial and parallel to the cross slide. **Y Axis and Motion:** It is perpendicular to both X and Z axes and the direction is identified by the right hand Cartesian coordinate system. **Rotary motions:** A, B and C define the primary rotary motions. **Location:** These motions are located about the axis parallel to X, Y and Z respectively. **Direction:** Positive A, B and C are in the directions which advance right-hand screws in the positive X, Y and Z directions respectively.	***Sketch of axis identification & sign convention = 02 marks, Explanation = 02 marks***
	f	**State the principle used in Lapping. List four applications of Lapping.**	***04***
	Ans	**Principle of Lapping:** Lapping is basically an abrasive process in which loose abrasives function as cutting points finding momentary support of the lap.	

The process has the following features.
(a) Use of loose abrasives between the lap and the work
(b) The lap and workpiece are not positively driven, but are guided in contact with each other
(c) Relative motion between the lap and work surface should be constantly changing. The effective path is of cycloid in nature.

Principle 02 Marks



&

Applications: (Any Four)
A. Hand lapping is used for
i. Press work dies
ii. Moulding dies
iii. Limit gauges
iv. Surface plates
v. Engine valve and valve seat
B. Machine lapping is used for
i. Races of ball and roller bearings
ii. Gears
iii. Piston rings
iv. Slip gauges
v. Crankshaft.

Appli. Any Four 02 Marks

6 **Attempt any TWO of the following:** *16*

a **(i) Compare Open Die Forging and Close Die Forging.**
(ii) Explain with neat sketch process of Drop Forging. *08*

Ans **(i) Difference between Open Die and Close Die Forging:**

Sr. No.	Open Die Forging Process	Close Die Forging Process
1.	It is also known as Flat or Smith Die Forging	It is also known as Impression Die Forging
2.	In this process dies have flat faces only.	In this process dies have cavities at inner surface.
3.	There may be chance to change shape & size of product.	There may be no chance to change shape & size of product due to cavity.
4.	Final shape of forging depends on skill of smith.	Final shape of forging depends on accuracy of die cavity.
5.	Complex parts can't be forged easily.	Complex part can be forged easily
6.	It is used to large volume of parts.	It is used to small volume of parts.
7.	Used for job production.	Used for Batch/ mass production.
8.	Less accuracy achieved.	More accuracy is achieved.

Any Four 01 Mark Each

(ii)Drop Forging
Drop forging is carried out by using drop hammers. They are board or gravity hammer, air lift hammer and power drop hammer. Anvil of drop forging hammer is attached to the frame to permit accurate alignment of upper and lower dies. The ram is fastened to the lower end of vertical hard wood board.

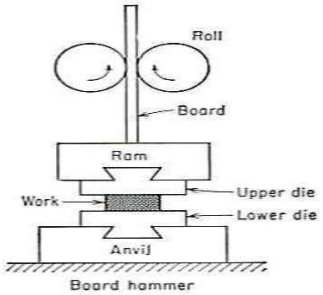
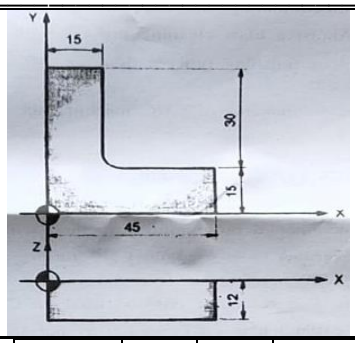


Figure: Drop Forging

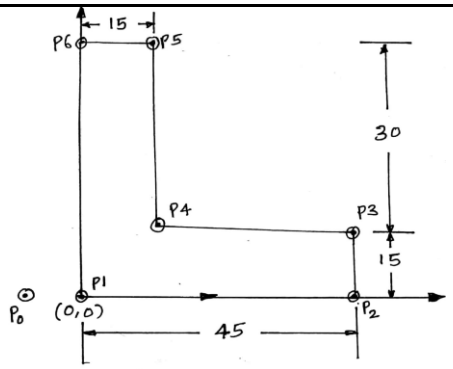
Explain. 02 Marks & Sketch 02 Marks

b **Write the part program for a component shown in figure 1 on a CNC milling machine. Use feed rate =0.2 mm/rev, speed = 600 rpm. Assume suitable data if necessary**



08

Ans



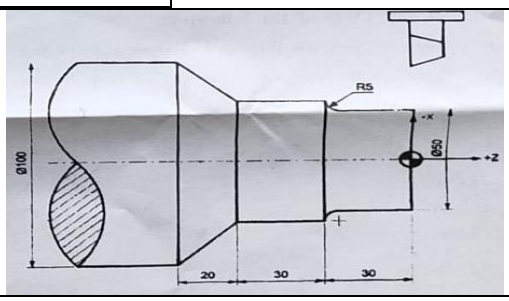
Point	X	Y	Z
P0	-10	0	-12
P1	0	0	-12
P2	45	0	-12
P3	45	15	-12
P4	15	15	-12
P5	15	45	-12
P6	0	45	-12
P1	0	0	-12

O1234;

N001	G28 U0 V0 W0;
N002	G90 G42 G95 G21;
N003	M03 S 600;
N005	M08;
N006	G00 X-10 Y0 Z-12;
N008	G01 X0 F 0.2;
N009	X45;
N010	Y15;
N011	X15;
N012	Y45;
N013	X0;
N014	Y0;
N015	G28U0 V0 W0;
N016	M05;
N017	M09;
N018	M30;

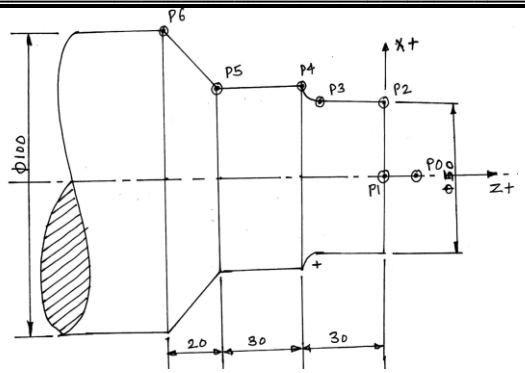
02 Marks for Coordinates
06 Marks For Program

c **Write the part program for a component shown in figure 2 on a CNC lathe machine. Use feed rate =0.2 mm/rev, speed = 1500 rpm. Assume suitable data if necessary.**



08

Ans



Point	X	Z
P0	**0**	**5**
P1	**0**	**0**
P2	**50**	**0**
P3	**50**	**-25**
P4	**60**	**-30**
P5	**60**	**-60**
P6	**100**	**-80**

O1234;	
N001	G28 U0 W0;
N002	G90 G21 G95;
N003	M03 S 1500;
N005	M08;
N006	G00 X0 Z 5;
N008	G01 X0 Z0 F0.2;
N009	X50;
N010	Z-25;
N011	G02 X60 Z-30 R5;
N012	G01 X60 Z-60;
N013	X100 Z-80;
N014	G28 U0 W0;
N015	M05;
N016	M09;
N017	M30;

02 Marks for Coordinates 06 Marks For Program