



**MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION**  
(Autonomous)  
(ISO/IEC - 27001 - 2005 Certified)  
**WINTER- 16 EXAMINATION**

**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
<b>1</b>	<b>a)</b>	<b>Attempt Any <u>SIX</u> of the Following:</b>	<b>(6 x 2 =12)</b>
<b>1.a</b>	<b>i)</b>	<b>Enlist any four forgeable materials.</b>	
	<b>Ans:</b>	Following are the forgeable materials; <b>Forgeable Materials:</b> (Any Four) 1) Aluminium alloys 2) Magnesium alloys 3) Copper alloys. 4) Carbon and low alloy steels 5) Martensitic stainless steels 6) Austenitic stainless steels 7) Nickel alloys 8) Titanium alloys 9) Columbium alloys 10) Tantalum alloys 11) Molybdenum alloys 12) Tungsten alloys 13) Beryllium.	<b>For any four ½ mark each</b>
<b>1.a)</b>	<b>ii)</b>	<b>Give Classification of Presses.</b>	
	<b>Ans:</b>	<b>1. Classification on the basis of source of power.</b> • Manual Presses.	



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		<ul style="list-style-type: none"> <li>• Mechanical presses.</li> <li>• Hydraulic Presses.</li> <li>• Pneumatic Presses.</li> </ul> <p><b>2. Classification on the basis of number of slides.</b></p> <ul style="list-style-type: none"> <li>• Single Action Presses.</li> <li>• Double Action Presses.</li> <li>• Triple Action Presses.</li> </ul> <p><b>3. Classification on the basis of frame and construction.</b></p> <ul style="list-style-type: none"> <li>• Arch – Frame Presses.</li> <li>• Gap Frame Presses.</li> <li>• Straight Side Presses.</li> <li>• Horn Presses.</li> <li>• Inclibable Press</li> </ul>	<p><b>For any TWO</b> <b>2 Marks</b></p>
<b>1.a)</b>	<b>iii)</b>	<b>State the working principle of gas welding.</b>	
	<b>Ans:</b>	<p><b>Working principle of gas welding:</b></p> <p>Gas Welding is a fusion welding process. It joins metals, using the heat of combustion of the oxygen/air and combustible gas (i.e. acetylene, hydrogen, propane, or butane) mixture. The purpose of flame is to heat and melt the parent metal and filler rod of the joint. The intense heat produced melts the edges of parts and fuses together to form the welded, generally with the addition of a filler metal. The torch mixes a combustible gas with oxygen in the proper ratio and flow rate providing combustion process at a required temperature.</p>	<p><b>2Marks</b></p>
<b>1.a)</b>	<b>iv)</b>	<b>Define Soldering. Give one application of soldering.</b>	
	<b>Ans:</b>	<p><b>Definition of Soldering:-</b></p> <p>Soldering is a method of uniting two or more piece of metal by means of a fusible alloy or metal, called solder, applied in the molten state.</p> <p><b>Applications of Soldering :</b></p> <ol style="list-style-type: none"> <li>1. Circuitry connections of radio &amp; T.V. sets,</li> <li>2. Wiring joints in electric connections &amp; battery terminals,</li> <li>3. Radiator brass tube,</li> <li>4. Copper tubing,</li> <li>5. Brass halved bearings,</li> <li>6. Joints in sheet metal objects such as food cans,</li> <li>7. Roof flashing,</li> <li>8. Rain gutters,</li> <li>9. Refrigeration and plumbing machine tools components,</li> </ol>	<p><b>1 Mark for Definition</b></p> <p><b>And</b></p> <p><b>½ mark each for any Two Correct Applications</b></p>



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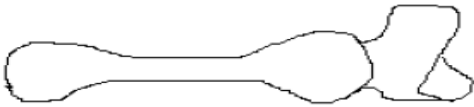
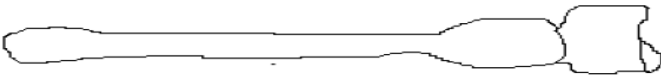

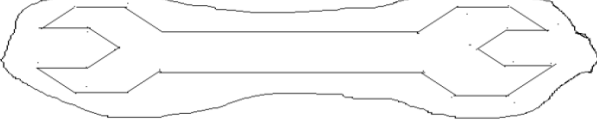

		10. Copper foil in stained glass work.	
<b>1.a)</b>	<b>v)</b>	<b>List any four surface finishing processes.</b>	
	<b>Ans:</b>	<b>List of Surface Finishing Processes:</b> [1] Grinding [2] Honing [3] Lapping [4] Burnishing [5] Buffing [6] Polishing	<b>For any Four - 1/2 mark each</b>
<b>1.a)</b>	<b>vi)</b>	<b>State the meaning of G90, G91.</b>	
		<b>Meaning of following G-Codes:</b> <b>G90 :-</b> Absolute Dimensioning <b>G91:-</b> Incremental Dimensioning	<b>1 Mark Each</b>
<b>1.a)</b>	<b>vii)</b>	<b>Enlist the two advantages and two disadvantages of CNC machines.</b>	
		<b>Advantages of CNC Machines:-</b> [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.  <b>Disadvantages of CNC Machines:-</b> 1) It has High Investment cost. 2) Higher maintenance cost. 3) Skill operator is required. 4) Training of operator is required. 5) High tooling cost. 6) Temperature, humidity & dust must be affect machining. 7) Initial cost is high.	<b>1/2 mark each For any Two Advantages</b>  <b>AND</b>  <b>1/2 mark each For any Two Disadvantages</b>



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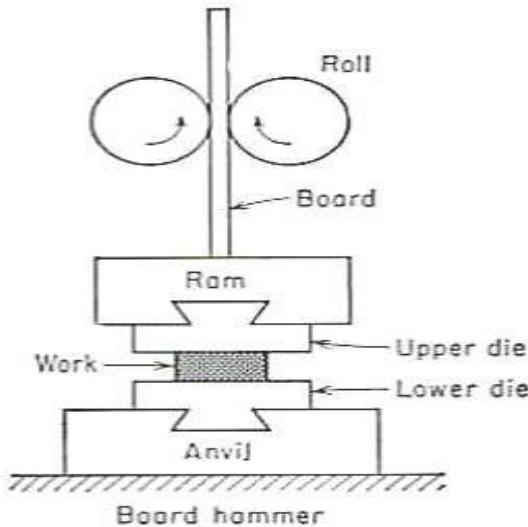
<b>1.a)</b>	<b>viii)</b>	<b>Define Forgeability.</b>	
	<b>Ans:</b>	<p><b>Definition of Forgeability:</b> Forgeability can be defined as the tolerance of a metal or alloy for deformation without failure.</p> <p style="text-align: center;"><b>OR</b></p> <p>Forgeability is defined as the ability of a metal to change size and shape when heated to required temperature and compressed by applying some pressure.</p>	<b>2 Marks for Correct definitions</b>
<b>1</b>	<b>b)</b>	<b>Attempt any <u>TWO</u> of the following:</b>	<b>(2 x 4 = 08)</b>
<b>1.b)</b>	<b>(i)</b>	<b>Describe the forging sequence for production of spanners.</b>	
	<b>Ans:</b>	<p><b>Forging Sequence for Production of Spanners:</b></p> <p>1) The heated stock is elongated by reducing its cross section in first die. The operation is known as “Fullering”.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p>2) The metal is redistributed, increasing the cross section at certain places and reducing at others as required filling the cavities of the die. The operation is known as “Edging”.</p> <div style="text-align: center;">  </div> <p>3) General shape is given in first blocking die.</p> <div style="text-align: center;">  </div> <p>4) Finished shape is given to forging in final impression die.</p> <div style="text-align: center;">  </div> <p>5) Flash is removed.</p> <div style="text-align: center;">  </div> <p>6) Heat treatment and machining is done as per requirement.</p>	<b>4 Marks for proper sequence with suitable sketches</b>



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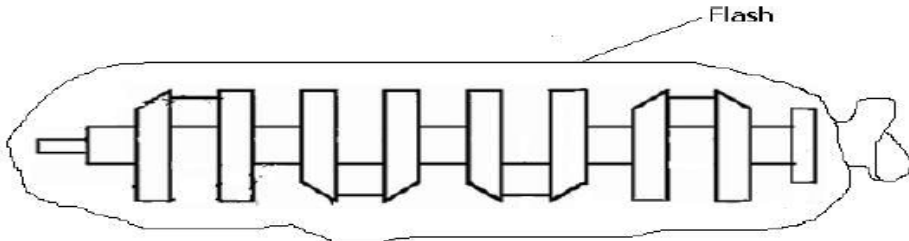
1.b)	(ii)	<b>Enlist any four advantages and disadvantages of forging process.</b>	
		<p><b>Advantages of Forging Process:-</b></p> <ol style="list-style-type: none"><li>1) Complex shaped parts can be forged</li><li>2) Mass production with greater accuracy is achieved.</li><li>3) It is very easy to maintain close tolerances.</li><li>4) Relatively good utilization of materials.</li><li>5) Does not require highly skilled operator.</li><li>6) Better reproducibility.</li><li>7) Machining is not necessary to obtain final shape.</li></ol> <p><b>Disadvantages of Forging Process:-</b></p> <ol style="list-style-type: none"><li>1) Initial cost of die is high.</li><li>2) High tool maintenance.</li><li>3) Limitation in size and shape.</li><li>4) Heat treatment process increases cost of the product.</li><li>5) Brittle materials like cast iron cannot be forged.</li><li>6) Complex shape cannot be produced by forging.</li><li>7) Rapid oxidation of metal surface at high temperature wears the dies</li></ol>	<p>1/2 Each for any four Advanta ges</p> <p>And</p> <p>1/2 Each for any four Disadva ntages</p>
1.b)	(iii)	<b>Explain drop forging with neat sketch.</b>	
		<p><b>Drop Forging Process:</b></p> <p>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.</p>  <p>Figure: Drop Forging</p>	<p>1 Marks for Significa nce</p> <p>2 Marks for Neat sketch</p> <p>and</p>



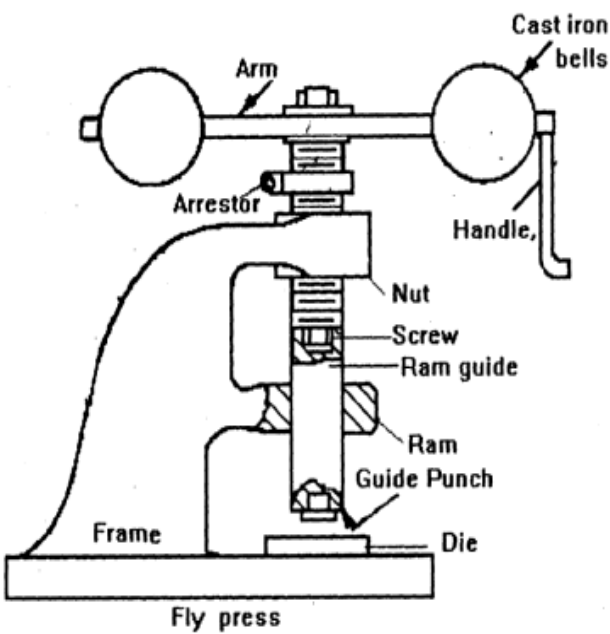
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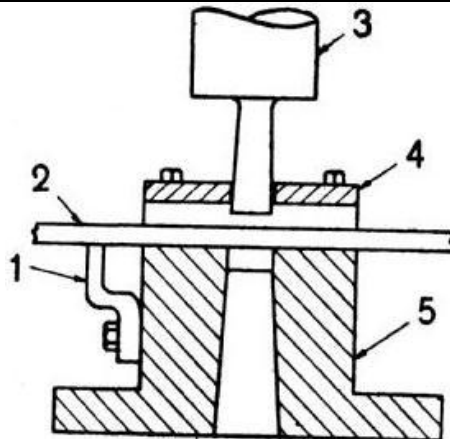
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		<p>[1] The upper die and ram are raised by friction rolls gripping the board.</p> <p>[2] After releasing the board, the ram falls under gravity to produce the blow energy.</p> <p>[3] The hammer can strike between 60-150 blows per minute depending on size and capacity.</p> <p>[4] The board hammer is an energy restricted machine. The blow energy supplied equals the potential energy due to the weight and the height of the fall.</p> <p>[5] This energy will be delivered to the metal work-piece to produce plastic deformation.</p>	<b>1 Marks for brief description</b>
<b>2</b>		<b>Attempt any <u>FOUR</u> of the following:</b>	<b>(4 x 4 =16)</b>
<b>2</b>	<b>a)</b>	<b>Write down the forging sequence for manufacturing crank shaft.</b>	
		<p><b>Forging Sequence for Manufacturing Crank Shaft:</b></p> <p>[1] Stock is redistributed and size is increased at certain place and reduced at other place by roll forging.</p>  <p>[2] After preliminary roll forging, stock is again roll forged.</p>  <p>[3] This stock is then forged in first impression or blocking die.</p>  <p>[4] The final shape is given to the forging in next blocking die.</p>	<b>2 Marks for Process</b>         <b>and 2 Marks for sketches</b>

		<p>[5] Then the finished part is then trimmed in blanking die to remove excess metal or flash.</p>	
2	b)	<b>Give Classification of forging process.</b>	
		<b>Classification of forging process:-</b> <b>I. Open die forging:</b> a) Hand forging b) Power forging: i. Hammer forging ii. Press forging  <b>II. Close die forging:</b> a) Drop forging b) Press forging c) Machine forging	<div>2 Marks</div> <div>2 Marks</div>
2	c)	<b>Describe the fly press with neat sketch.</b>	
		<b>Fly Press :</b> It is simplest type of all presses, called as hand press / ball press/single side fly press. It consists of robust cast iron frame. Top portion of frame forms the nut. Vertical screw which can go through the nut. Screw carries an arm. Arm supports two cast iron weights (balls) at two ends. Handle used for rotating the arm. Frame extended below the nut to form guides. Ram attached at the bottom of the screw.	<div>2 Marks for Description</div> <div>and</div>

		<p>Ram carries punch at its bottom. Die is fixed at the press base. Sheet metal placed over the die. Arm gets quick rotation with the help of handle. Heavy balls stores kinetic energy for long time movement of screw. Movement of screw causes movement of ram &amp; punch downwards. Stroke of the collar adjusted with help of Stop Collar / Arrestor. Advance type of fly press is double side Press.</p>  <p style="text-align: center;"><b>Figure: Construction of Fly Press</b></p>	<p><b>2 Marks for labelled Sketch</b></p>
<b>2</b>	<b>d)</b>	<p><b>Explain the following press operations</b></p> <p><b>(a) Punching</b></p> <p><b>(b) Drawing</b></p>	
		<p><b>a) Punching:</b></p> <p>In punching operation, a hole is the desired result. The size of hole is determined by the size of punch and clearance is allowed on the die. The figure shows the spacing of hole on plate 2 is actuated by the stop 1 the stripper plate 4 is attached to die body 5 prevents sheet metal from being lifted along with the punch 3 after punching operation.</p>	<p><b>1 Mark for Descript ion</b></p> <p style="text-align: center; margin-top: 20px;"><b>and</b></p> <p style="text-align: center; margin-top: 20px;"><b>1 Mark</b></p>





(1.Stop, 2.Plate, 3.Punch, 4.Stripper plate, 5.Die)

**Figure : Punching Operation**

**b) Drawing:**

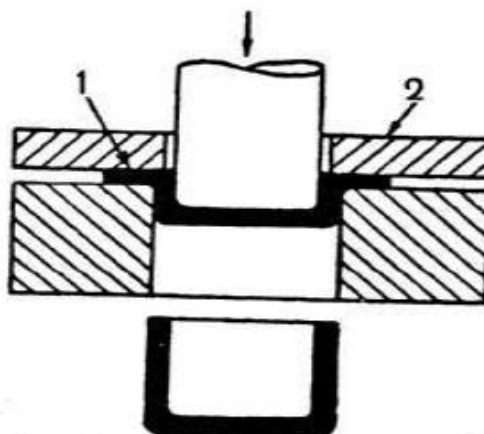
[1] The drawing is the operation of production of cup shaped parts from flat sheet metal blanks by bending and plastic flow of the metal.

[2] The blank is placed on die and while punch descends, 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.

[5] The drawing operation is illustrated in Fig.



(1: Blank , 2:- Pressure Pad)

**Figure:- Drawing Operation**

**for neat Sketch**

**1 Mark for Description**

**and**

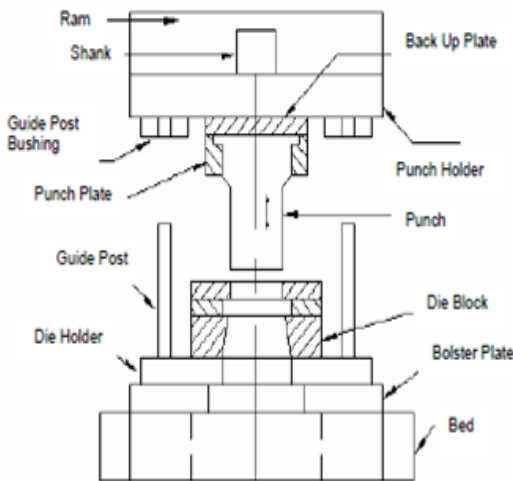
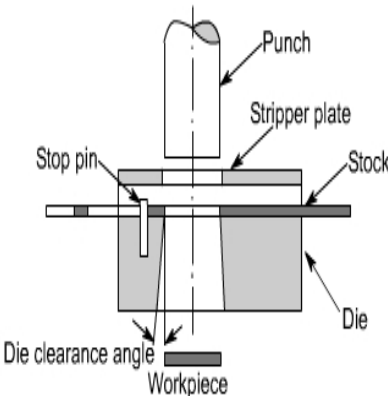
**1 Mark for neat Sketch**



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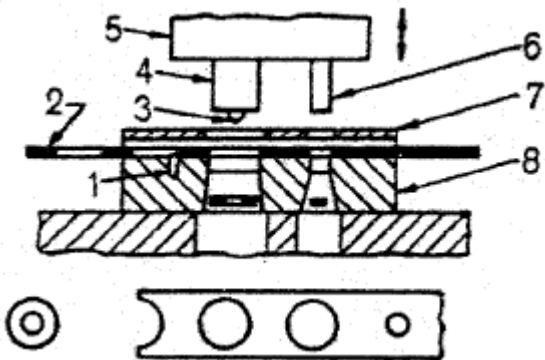
<b>2</b>	<b>e)</b>	<p><b>Describe simple die with neat sketch.</b></p> <p><b>Simple Die:</b> Simple die or single action dies perform single operation for each stroke of the press slide. The operation may be cutting or forming operation such as blanking, punching, piercing etc. performed on these dies. The operations can be performed in a single action of the press slide giving output. These dies are simple in construction and can manufacture by conventional machining processes.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;"><b>Or</b></p> <p style="text-align: center;"><b>Figure:- Simple Die</b></p>	<p><b>2 Marks for Explanation</b></p> <p><b>2 Marks for any correct figure</b></p>
<b>2</b>	<b>f)</b>	<p><b>List the materials used in press work for automobile components parts with example.</b></p> <p><b>Materials used in press work:</b></p> <ol style="list-style-type: none"> <li>1) Aluminium,</li> <li>2) Copper,</li> <li>3) Brass,</li> <li>4) Mild Steel,</li> <li>5) Galvanized iron (G.I) sheets,</li> <li>6) Duralumin,</li> <li>7) Y-alloys,</li> <li>8) Naval Brass,</li> <li>9) Cartridge Brass,</li> <li>10) Babbitt Metal</li> </ol>	<p><b>1/2 Mark each for any four Materials</b></p> <p><b>And</b></p>

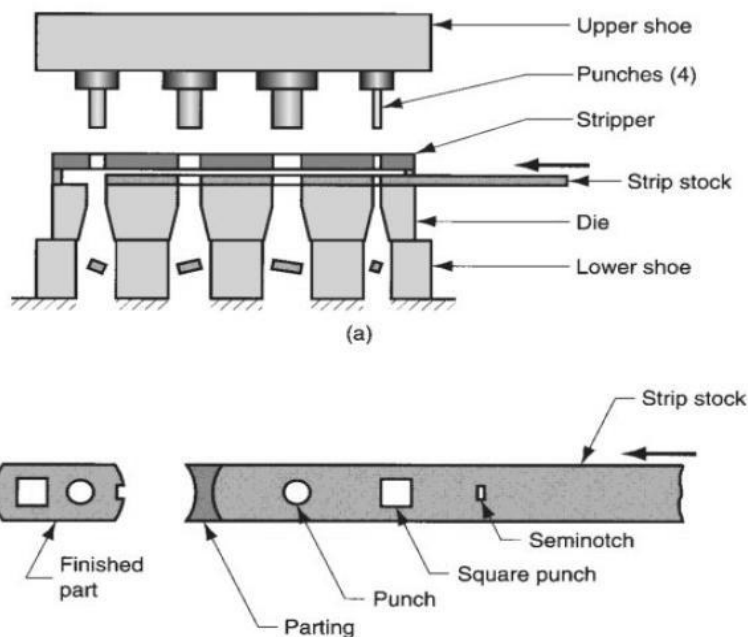


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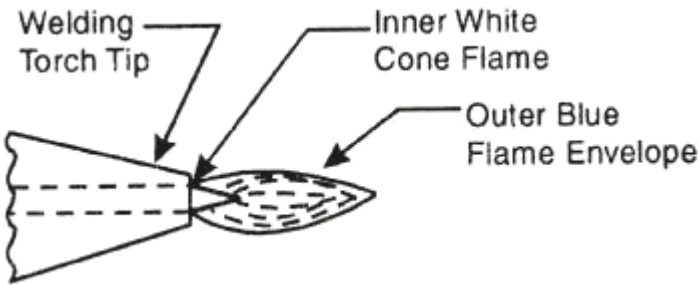
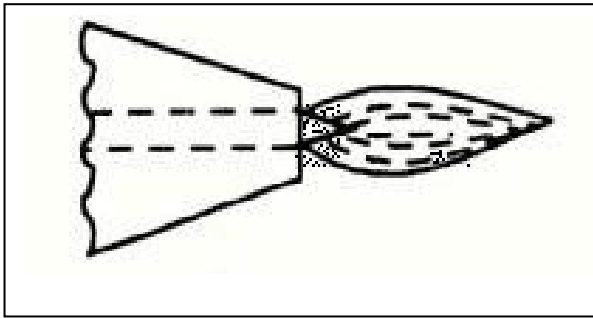
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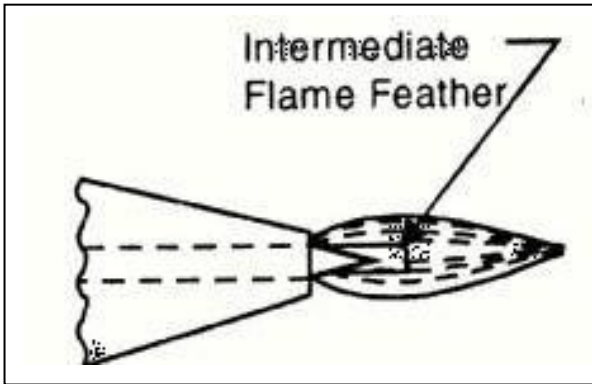
		<b>Examples (Applications) of above Materials used in press work for following Automobile Components:-</b> 1) Gears 2) Crank Shafts 3) Automobile panels 4) Wires 5) Frames and Chassis 6) Connecting Rods 7) Springs 8) Carburettor bodies 9) Valves 10) Combustion Chamber 11) Cylinder heads , blocks,                      12) Gear box cases	<b>1/2 Mark each for any four Examples (Applications)</b>
<b>3</b>		<b>Attempt any FOUR of the following:</b>	<b>4*4=16</b>
	<b>a)</b>	<b>Describe the working of progressive die with neat sketch.</b>	<b>4</b>
	<b>Answer:</b>	<p><b>Working of Progressive Die:</b>            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.</p>  <p style="text-align: center;">1. Stop 2.sheet metal 3.pilot 4.blanking punch 5.ram 6.piercing punch 7.stripper 8.die</p> <p style="text-align: center;"><b>OR</b></p>	<p><b>2Marks</b></p> <p><b>2Marks</b></p>



<b>3</b>	<b>b)</b>	<b>Give classification of welding process.</b>	<b>4</b>
<b>Answer:</b>	<p><b>Classification of Welding Process</b> Depending on method of heat generation American welding society classifies welding as</p> <p><b>a. Arc welding</b></p> <ol style="list-style-type: none"> <li>1) Carbon Arc Welding;</li> <li>2) Shielded Metal Arc Welding (SMAW)</li> <li>3) Submerged Arc Welding (SAW)</li> <li>4) Metal Inert Gas Arc Welding (MIG, GMAW)</li> <li>5) Tungsten Inert Gas Arc Welding (TIG, GTAW)</li> <li>6) Electroslag Welding (ESW)</li> <li>7) Plasma Arc Welding (PAW)</li> </ol> <p><b>b. Resistance Welding (RW)</b></p> <ol style="list-style-type: none"> <li>1) Spot Welding (RSW)</li> <li>2) Flash Welding (FW)</li> <li>3) Resistance Butt Welding (UW)</li> <li>4) Seam Welding (RSEW)</li> </ol> <p><b>c. Gas Welding (GW)</b></p> <ol style="list-style-type: none"> <li>1) Oxyacetylene Welding (OAW)</li> <li>2) Oxyhydrogen Welding (OHW)</li> <li>3) Pressure Gas Welding (PGW)</li> </ol> <p><b>d. Solid State Welding (SSW)</b></p> <ol style="list-style-type: none"> <li>1) Forge Welding (FOW)</li> </ol>		<p><b>1 Mark Each for Any Four</b></p>

		<p>2) Cold Welding (CW)  3) Friction Welding (FRW)  4) Explosive Welding (EXW)  5) Diffusion Welding (DFW)  6) Ultrasonic Welding (USW)</p> <p><b>e. Thermit Welding (TW)</b></p> <p><b>f. Electron Beam Welding (EBW)</b></p> <p><b>g. Laser Welding (LW)</b></p>	
<b>3</b>	<b>c)</b>	<b>Explain seam welding process with the help of neat sketch.</b>	<b>4</b>
		<p><b>Seam Welding</b> is a Resistance Welding (RW) process used for producing continuous joint of overlapping sheets by passing them between two rotating electrode wheels. Heat generated by the electric current flowing through the contact area and pressure provided by the wheels are sufficient to produce a leak-tight weld. Seam Welding is high speed and clean process. Coolant is used to conserve the electrodes and cool the work rapidly to speed up the operation.</p> <div style="text-align: center;"> </div> <p><b>Fig. Seam Welding</b></p>	<p><b>2 Marks</b>  <b>Descript</b>  <b>ion</b></p> <p><b>2 Marks</b>  <b>sketch</b></p>

<b>3</b>	<b>d)</b>	<p><b>Name various types of flames used in gas welding. Explain any one type of flame with sketch.</b></p>	
	<b>Answer:</b>	<p><b>Types of Flames</b>            1) Neutral Flame                      2) Oxidizing Flame            3) Carburizing Flame</p> <p><b>1) Neutral Flame</b>            When oxygen and acetylene are supplied to the torch in nearly equal volumes, a neutral flame is produced. It has two definite zones -1) A sharp brilliant inner cone, 2) An outer cone or envelop of bluish colour.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Fig :- Neutral Flame</p> <p><b>2) Oxidizing Flame :-</b>            An oxidizing flame is one in which there is an excess of oxygen. The flame has two zones- 1)the smaller inner cone which has purplish tinge, 2)the outer cone or envelop</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Fig :- oxidizing Flame</p>	<p><b>1 mark for Types</b></p> <p><b>2 marks for Explanation and</b></p> <p><b>1 Marks for sketch.</b></p>

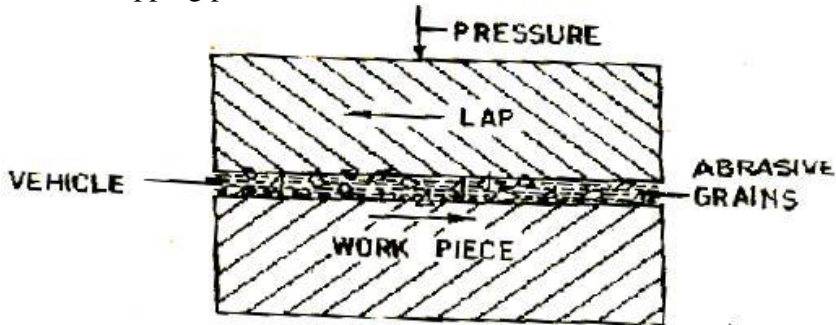
		<p><b>3) Carburizing Flame:</b></p> <p>A carburizing flame is one there is an excess of acetylene. The flame has three zones</p> <ol style="list-style-type: none"> <li>1) Sharply defined inner cone</li> <li>2) An intermediate cone of whitish colour.</li> <li>3) Bluish outer cone</li> </ol> <div style="text-align: center;">  </div> <p style="text-align: center;">Fig:- carburizing flame</p>	
<b>3</b>	<b>f)</b>	<b>State the types of pilots and state its use.</b>	<b>4</b>
	<b>Answer:</b>	<p><b>Types of Pilots are</b></p> <ol style="list-style-type: none"> <li>a) Direct pilot</li> <li>b) Indirect Pilot</li> </ol> <p><b>USES of Pilot</b></p> <ol style="list-style-type: none"> <li>1. Pilots are used to position the stock strip accurately.</li> <li>2. Pilots bring the stock strip into proper position for blanking and piercing operations.</li> </ol>	<p><b>2 Marks for Types</b></p> <p><b>2 Marks for Uses</b></p>



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4		Attempt any four of the following	4*4=16																											
4	a)	Compare arc welding with resistance welding.	4																											
	Answer	<table><tr><th>Sr.</th><th>Arc welding</th><th>Resistance welding</th></tr><tr><td>1</td><td>It is fusion welding</td><td>It is plastic welding</td></tr><tr><td>2</td><td>Arc is produced by heating with an electric arc, mostly without application of pressure and filler material</td><td>Arc is produced by heat due to resistance to flow of current by work &amp; by application of pressure</td></tr><tr><td>3</td><td>Filler metal may used</td><td>Filler metal is not used</td></tr><tr><td>4</td><td>Low welding speed</td><td>High welding speed can achieved</td></tr><tr><td>5</td><td>Supply can be A.C or D.C</td><td>Supply is A.C only</td></tr><tr><td>6</td><td>Striking voltage is high</td><td>voltage require is low</td></tr><tr><td>7</td><td>Welding of similar and dissimilar metal is quite difficult</td><td>Both similar and dissimilar metal can be welded easily</td></tr><tr><td>8</td><td>More skilled operator can do the job</td><td>Less skilled operator can do the job</td></tr></table>	Sr.	Arc welding	Resistance welding	1	It is fusion welding	It is plastic welding	2	Arc is produced by heating with an electric arc, mostly without application of pressure and filler material	Arc is produced by heat due to resistance to flow of current by work & by application of pressure	3	Filler metal may used	Filler metal is not used	4	Low welding speed	High welding speed can achieved	5	Supply can be A.C or D.C	Supply is A.C only	6	Striking voltage is high	voltage require is low	7	Welding of similar and dissimilar metal is quite difficult	Both similar and dissimilar metal can be welded easily	8	More skilled operator can do the job	Less skilled operator can do the job	1 Mark Each for Any Four
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4	b	Explain lapping process with neat sketch	4																											
	Answer:	<p><b>Answer: Lapping</b> 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. Figure shows the lapping process.</p> <div></div> <p><b>Fig. Principle of lapping.</b></p>	2 Marks for description   <																											





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4	c	Describe electrolytic cleaning process.	4
	Answer:	<p>(description – 4 mark &amp; Credit should be given to sketch )</p> <p><b>Electrolytic Cleaning:</b></p> <p>This is effective as final cleaning process for removing oil and grease from machined surface when extreme cleanliness is required. It is almost always used for final cleaning of steel parts prior to electro-plating.</p> <p>In electrolyte cleaning, an alkaline cleaning solution is used with electric current passing through the bath in which the parts to be cleaned is one electrode. This causes the emission of oxygen at the positive pole and hydrogen at negative pole.</p> <p>The material from which part is made and the cleaning action desired determine whether the part should be made anode or cathode. Parts of soft metals must be cleaned cathodically because they would be badly itched if cleaned anodically. Steel is anodically cleaned because of absence of embrittlement and smut deposition.</p> <p>Chlorides should be carefully avoided and the soap content should be low or excessive foaming with danger of explosion may result.</p>	4 Marks
4	d	Explain the galvanizing process and give its two applications.	4
	Answer:	<p><b>Galvanization or galvanisation or galvanizing</b> is the process of applying a protective zinc coating to steel or iron, to prevent rusting. The most common method is hot-dip galvanizing, in which parts are submerged in a bath of molten zinc. Galvanizing protects in three ways:</p> <ol style="list-style-type: none"><li>1. It forms a coating of zinc which, when intact, prevents corrosive substances from reaching the underlying steel or iron</li><li>2. The zinc serves as a sacrificial anode so that even if the coating is scratched, the exposed steel will still be protected by the remaining zinc.</li><li>3. The zinc protects its base metal by corroding before iron. For better results, application of chromates over zinc is also seen as an industrial trend.</li></ol> <p><b>Applications:</b></p> <p>Galvanizing: It is used for -</p> <p>1. all forms of outdoor structural parts 2. Pipes 3. Sheetting for roofs 4. wash tubs 5. All sort of containers 6. telegraph wire 7. fencing materials 8. Transformer parts</p>	<p>2 Marks for Description</p> <p>2 Marks For Any two applications</p>



4	e	Differentiate between CNC and NC machines.	4																		
		<div>(Any four – 1 Mark each)</div> <table><tr><td>Sr. No.</td><td>NC System</td><td>CNC System</td></tr><tr><td>1</td><td>Instruction fed through external medium i.e. Paper tape / magnetic tape.</td><td>Instruction fed through part program (internal medium) stored in computer memory.</td></tr><tr><td>2</td><td>Small changes in program are not possible on punch tape once produced.</td><td>Small changes in program are possible on punch tape once produced.</td></tr><tr><td>3</td><td>No facility for dry run.</td><td>Facility for dry run.</td></tr><tr><td>4</td><td>Additional information such as number of jobs produced, time per component cannot be obtained.</td><td>Additional information such as number of jobs produced, time per component can be obtained.</td></tr><tr><td>5</td><td>It does not allow compensation for change in cutting tool dimension.</td><td>It does allow compensation for change in cutting tool dimension.</td></tr></table>	Sr. No.	NC System	CNC System	1	Instruction fed through external medium i.e. Paper tape / magnetic tape.	Instruction fed through part program (internal medium) stored in computer memory.	2	Small changes in program are not possible on punch tape once produced.	Small changes in program are possible on punch tape once produced.	3	No facility for dry run.	Facility for dry run.	4	Additional information such as number of jobs produced, time per component cannot be obtained.	Additional information such as number of jobs produced, time per component can be obtained.	5	It does not allow compensation for change in cutting tool dimension.	It does allow compensation for change in cutting tool dimension.	4
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5	It does not allow compensation for change in cutting tool dimension.	It does allow compensation for change in cutting tool dimension.																			
4	f	Enlist any four disadvantages of NC machine.	4																		
	Answer:	<div>Disadvantages of NC machines</div> <div>1. High initial cost</div> <div>2. Higher maintenance cost</div> <div>3. Higher tooling cost</div> <div>4. Need for a controlled environment</div> <div>5. Higher personnel/operator costs</div>	Any Four -1 mark each																		
5		Attempt any FOUR of the following	4*4=16																		
5	a)	Give the classification of CNC machine.	4																		
	Ans:-	<div>Classification of CNC machines.</div> <div>A. According to control loop feedback system:</div> <div>1) Open – loop system</div> <div>2) Closed – loop system</div> <div>B. According to type of tool motion control system:</div> <div>1) Finite positioning control system:</div> <div>a) Point – to – point system</div> <div>b) Straight cut system</div> <div>2) Continuous path system:</div> <div>a) Two axes contouring</div> <div>b) Two &amp; half axes contouring</div> <div>c) Three axes contouring</div> <div>d) Multi – axis contouring</div>	<div>1 Mark</div> <div>1 Mark</div>																		

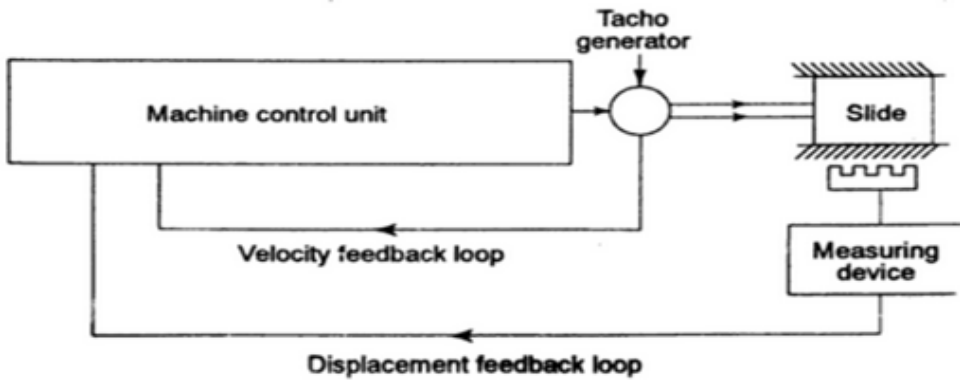


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		<b>C. According to programming methods:</b> 1) Absolute programming method 2) Incremental programming method <b>D. According to type of controller:</b> 1) NC based controller system 2) CNC based controller system	<b>1 Mark</b>
			<b>1 Mark</b>
<b>5</b>	<b>b</b>	<b>Explain the working principle of CNC machine</b>	<b>4</b>
	<b>Ans:-</b>	<p><b>Block Diagram of working principle of CNC machine:</b></p> <p><b>Working principle of CNC machine:</b> In CNC machine, tape reader or any other input media is used for entry of part program. In this entire program is first feed to the inbuilt computer memory. Once the program is stored, the machine cycle is then executed by the program. Software with control algorithms converts part program instruction into actions by the machine tool. This is done by generating pulses for each axis from the controller. Each pulse produces one small unit of motion (SUM). The slide travel is thus decided by the number of pulses. In a closed loop system, the pulses are feed to reference. The feedback device also send signal to the reference. These two signals are compared and necessary action is controlled.</p>	<p><b>02 marks for block diagram</b></p> <p><b>and</b></p> <p><b>02 marks for Working principle</b></p>

5	c)	<b>Describe close loop control CNC system.</b>	4
	<b>Ans:-</b>	<p><b>Close loop control CNC system.</b> In <b>closed loop</b> control system the actual output from the system (i.e. actual displacement of the machine slide) is compared with the input signal. This system is characterized by the presence of feedback devices in the system. In this system, the displacement can be achieved to a very high degree of accuracy because a measuring or monitoring device is used to determine the displacement of the slide. The feedback from the mounting device is then compared with the input signal and the slide position is regulated by the servo system until it agrees with the desired. Although more costly and complex than open loop system, these system gives more accurate positioning.</p>  <p style="text-align: center;"><b>Figure :- Close loop control CNC system.</b></p>	<p><b>2 marks-Explanat ion :-</b></p> <p><b>Sketch :- 2 marks ,</b></p>
5	d)	<b>State the functions of following ISO Codes G00 ,G02,M02,M30</b>	4
	<b>Ans:-</b>	<p><b>Functions of ISO codes</b></p> <p><b>1) G00 :- Rapid Traverse Function</b> G00 is the basic G-code for CNC programming to initiate rapid motion mode i.e used for quickly positioning the tool. G00 can be used where the tool is not directly in contact with work piece and where one wants to save the time.</p> <p><b>2) G02 :- Circular interpolation clockwise</b> It allows programmed tool movements along the arc to cut the arc in clockwise direction (clockwise arc)</p> <p><b>3) M02 :- Program Stop (without program reset)</b> The M02 code is used to end a program. But the Program won't reset to the beginning of the program for the next cycle. The Operator has to manually reset the program if M02 is used.</p> <p><b>4) M30 :-Program End with program reset    OR</b> <b>End of tape- Tape rewind Automatically</b> The most common way of ending a program is with an M30. The program will automatically reset to the begin of the program which will give access to the operator to run the next cycle. Using M30 will help operator to save time during mass production. As soon as the program ends he can place the next component and start the next cycle.</p>	<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p>



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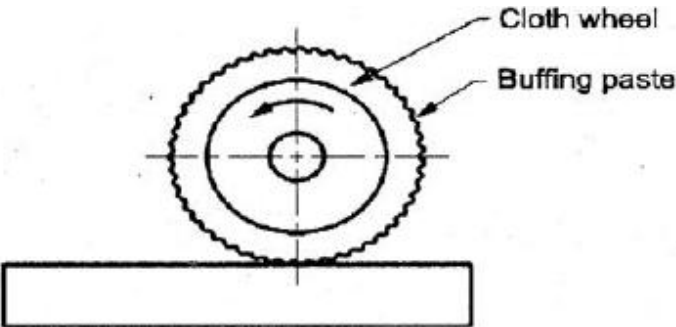
5	e)	<b>Give procedure for developing the part programming.</b>	
	Ans:-	<p><b>Procedure for developing part program</b> There are two methods of part programming: manual part program and computer assisted part programming.</p> <p><b>Manual part programming:</b></p> <ol style="list-style-type: none"><li>1. To prepare a part program using the manual method. The programmer writes the machining instructions on a special form called a part programming manuscript. The manuscript is a listing of the relative tool and work piece location.</li><li>2. The NC tape is prepared directly from the manuscript.</li><li>3. Define the axis coordinates in relation to the work part.</li><li>4. Define safe (target point) point and origin point (work zero).</li><li>5. The tape is inserted to read the first block in to the system.</li><li>6. The functions like machining, tool changing, spindle ON/OFF, coolant ON/OFF, program stop and tape rewinding are carried out as per the program.</li></ol> <p style="text-align: center;"><b>OR</b></p> <p><b>Computer- assisted part programming:</b> This method is useful for most critical and complex parts. The part programmer and the computer are main tools in this method.</p> <ol style="list-style-type: none"><li>1. The part programmer first defines the work part geometry</li><li>2. He specifies the operation sequence and tool path</li><li>3. The computer interprets the list of part programming instructions, performs the necessary calculations to convert this into a detailed set of machine tool motion commands, and then controls a tape punch device to prepare the tape.</li><li>4. The tape is verified for accuracy.</li><li>5. The NC system machines (makes) the part according to the instructions on tape.</li></ol>	<b>Any one method 4 marks</b>



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5	f	State the buffing process with their applications	4
	Ans:	<p><b>Buffing process :-</b> Buffing is used to give a much higher, lustrous, reflective finish that cannot be obtained by polishing. The buffing process consists in applying very fine abrasives with rotating wheel. Buffing wheels are made of discs of linen, cotton, broad cloth and canvass. They are made more or less firm by the amount of stitching used to fasten the layers of the cloth together. The abrasive is mixed with binder and is applied either on the buffing wheel or on the work. The abrasives may consist of iron oxide chromium oxide, emery etc. The binder is a paste consisting of wax mixed with grease, paraffin and kerosene, or turpentine and other liquid. In this process, work piece is brought in contact with a revolving, cloth buffing wheel that has been charged with very fine abrasive. The abrasives removes minute amount of metal from the work piece, eliminate fine scratch marks and produce a very smooth surface. Buffing is used to apply high luster to the work piece. <b>Applications :-</b> Automobiles, motor-cycles, boats, bicycles, sporting items, tools, store fixtures, commercial and residential hardware and household utensils and appliances.</p>  <p style="text-align: center;"><b>Figure :- Buffing</b></p>	<p><b>2 Marks descripti on</b></p> <p><b>1 mark for applicati on</b></p> <p><b>1 Marks for Figure</b></p>



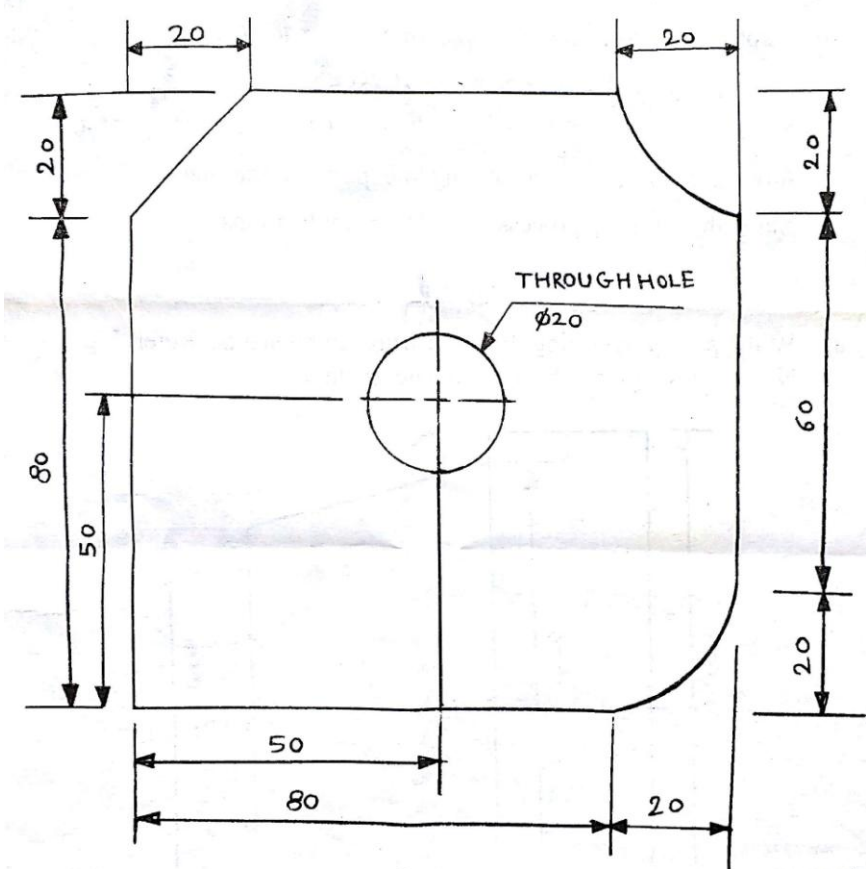
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6		Attempt any TWO of the following	2*8=16																								
	a)	Write part programming for following component. Also give the co-ordinate system	8																								
		<div><table><tr><th>Point</th><th>X</th><th>Z</th></tr><tr><td>P0</td><td>0</td><td>2</td></tr><tr><td>P1</td><td>0</td><td>0</td></tr><tr><td>P2</td><td>60</td><td>0</td></tr><tr><td>P3</td><td>80</td><td>-40</td></tr><tr><td>P4</td><td>90</td><td>-40</td></tr><tr><td>P5</td><td>90</td><td>-65</td></tr><tr><td>P6</td><td>95</td><td>20</td></tr></table><p>(Note N01 to N03 – 1Marks, N04 to N09—4Marks and N010 to N12—1Marks) N01 G90 G95 G71 E0B N02 M06 T01 E0B N03 M03 M08 S1000 E0B N04 G00 X0.0 Z2.0 E0B N05 G01 X0.0 Z0.0 EOB N06 G01 X60.0 Z0.0 EOB N07 G01 X80.0 Z-40.0 EOB N08 G01 X90.0 EOB N09 G01 Z-65.0 EOB N10 G00 X95.0 Z20.0 EOB N11 M05 M09 EOB N12 M30 EOB</p></div>	Point	X	Z	P0	0	2	P1	0	0	P2	60	0	P3	80	-40	P4	90	-40	P5	90	-65	P6	95	20	<div>2Marks for Co- ordinate Table</div> <div>06 marks- Progra m</div>
Point	X	Z																									
P0	0	2																									
P1	0	0																									
P2	60	0																									
P3	80	-40																									
P4	90	-40																									
P5	90	-65																									
P6	95	20																									



6	b)	Write part programming for following component. Assume suitable data if required.																																									
		<div><p>THROUGH HOLE ϕ20</p><p>ASSUME PLATE Thickness as 50MM.</p><p>ALL DIM ARE IN MM.</p></div>																																									
		<table><tr><th>POINT</th><th>X</th><th>Y</th><th>Z</th><th>R</th></tr><tr><td>1</td><td>0</td><td>0</td><td>5</td><td></td></tr><tr><td>2</td><td>0</td><td>0</td><td>-50</td><td></td></tr><tr><td>3</td><td>80</td><td>0</td><td>-50</td><td></td></tr><tr><td>4</td><td>100</td><td>20</td><td>-50</td><td>20</td></tr><tr><td>5</td><td>100</td><td>80</td><td>-50</td><td></td></tr><tr><td>6</td><td>80</td><td>100</td><td>-50</td><td>20</td></tr><tr><td>7</td><td>20</td><td>100</td><td>-50</td><td></td></tr></table>	POINT	X	Y	Z	R	1	0	0	5		2	0	0	-50		3	80	0	-50		4	100	20	-50	20	5	100	80	-50		6	80	100	-50	20	7	20	100	-50		2 Mark Co- ordinate table
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7	20	100	-50																																								



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8	0	80	-50	
9	0	0	-50	
10	0	0	5	
11	-20	15	5	
12	50	50	5	
13	50	50	-50	
14	50	50	5	
15	-20	15	5	

N01 G00 G90 G95 G71 G41E0B

N02 G54 E0B (work of set x01 y0 defined)

N03 T01 M06 E0B

N04 S1000 M03 E0B

N05 M08 E0B

N06 G00 X0.0 Y0.0 Z5.0 E0B

N07 G01 Z-50 F0.1 EOB

N08 X 80.0 EOB

N09 G03 X100.0 Y20.0 I0 J20 EOB

N10 G01 Y80.0 EOB

N11 G02 X80.0 Y100.0 I0 J-20 EOB

N12 G01 X 20.0 EOB

N13 X0.0 Y 80.0 EOB

N14 X0.0 Y0.0 EOB

N15 G00 Z 5.0 EOB

N16 X-20.0 Y15.0 EOB

N 17 M05 M09 EOB

N18 G90 G71 G95 EOB

N19 M06 T0202 EOB

N20 M08 M03 S1000 EOB

N21 G00 X50.0 Y50.0 EOB

N22 G01 Z-50 F0.1 EOB

N23 G00 Z5.0 EOB

N24 X-20.0 Y 15.0 EOB

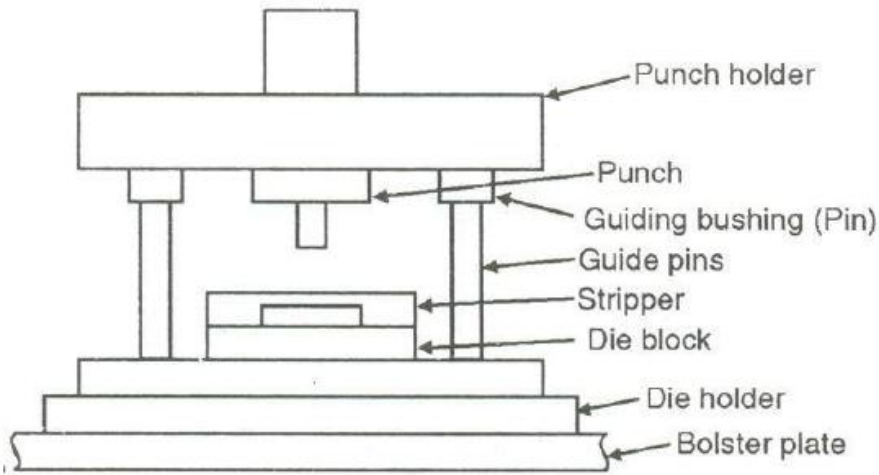
N25 M05 M09 EOB

N26 M30 EOB

1 Mark

4Marks

1Mark

6	c)	Explain the parts of standard die set with neat sketch. Write function of any four parts	8
	Ans:-	 <p>Die set is unit assembly which incorporates a lower and upper shoe, two or more guide posts and guide post bushings. It consist of following parts</p> <ol style="list-style-type: none"> <li><b>1)Die</b> Die is the female part of a complete tool for producing work in a press. It is also referred to a complete tool consisting of pair of mating members for producing work in press.</li> <li><b>2)Die Block</b> It is the block or a plate which contains the die cavity.</li> <li><b>3)Lower Shoe</b> The lower shoe of a die set is generally mounted on the upper plate of a press. The die block is mounted on the lower shoe. The guide posts are also mounted in it.</li> <li><b>4)Punch</b> Punch is the male component of the die assembly which is directly or indirectly moved by or fastened to the press ram or slide.</li> <li><b>5)Upper Shoe</b> It is the upper part of the die set which contain die post bushings.</li> <li><b>6)Back Up Plate</b> It is also called pressure plate. It is placed so that the intensity of pressure does not become excessive on punch holder. The plate distributes the pressure over a wide area and intensity of pressure on the punch holder is reduced to avoid crushing.</li> <li><b>7)Stripper</b> Stripper is a plate which is used to strip the metal strip from a cutting or non-cutting punch or die. It may also guide the strip.</li> </ol>	<p>4 marks for sketch and</p> <p>1 mark each for function of any 4 parts</p>