



WINTER -14 EXAMINATION

Subject Code: 17403

Model Answer

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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 judgment on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

1. a) Attempt any SIX of the following :	12
i) Describe any two forging defects with their remedies.	2
Answer: : Most commonly found forging defects and their remedies in metals: <i>(Any two- 1 mark each; ½ mark for defect and ½ mark for remedy)</i>	
1) Cold Shuts: Short cracks at corners and at right angles to the surface of forging. It is caused due to metal surface folding against itself during forging. Remedy: Die design should make properly.	2
2) Pitting: Small pits (Depressions) on surface. It is caused by scale. When scales are removed from surface, depressions remain which are known as scale pits. Remedy: Pure ingots should be selected and dies must be cleaned properly after operation.	
3) Die shift: It is caused by misalignment between top and bottom forging dies. Remedy: Proper mechanism should be used to avoid mismatching.	
4) Incomplete filling of dies: Undersize of forging due to less amount of metal. It is caused by wrong amount of metal, insufficient number of blows, incorrect die design or low temperature of stock. Remedy: Ingot size must be sufficient, hammering should be done properly, die should be designed correctly and temperature of stock should be sufficient.	
5) Dents: Dents are the result of careless work. Remedy: Proper care should be taken while handling of hot billets etc.	



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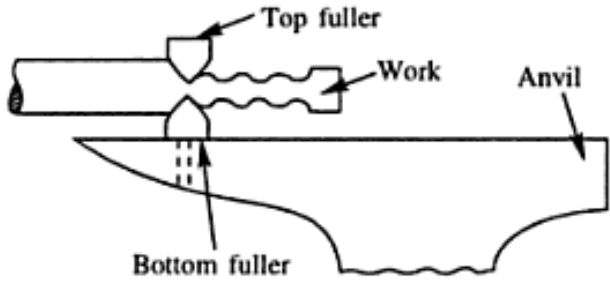
ii) State the significance of “Bolster plate and Backup plate”.	2
Answer: Significance of Bolster plate and Backup plate (1 mark each) Bolster plate: The bolster plate is a flat plate fitted on the base of Press for supporting the die block and other accessories of the press. Backup plate: The backup plate is used for the purpose of backing up so as to prevent components such as small diameter punches, etc., from getting too deep inside the holder due to the force of press operation. Apart from that, backing plates are used for preventing the parts from getting detached (stripper backing plate) and for adjusting the height of the die.	1 1
iii) Define brazing and enlist any two applications.	2
Answer: Brazing: Brazing is similar to soldering .It gives a much stronger joint than soldering. The harder filler material used in brazing known as spelter which fuses at some temperature above red heat, but below melting temperature of the parts to be joined. Applications: (Any two – ½ marks each) 1) Assembly of pipe fittings 2) Carbide tips to tools 3) Radiators 4) Heat exchangers 5) Electrical parts, 6) Repair of castings, joining of special materials like stainless steels.	1 1
iv) List all equipments required for gas welding.	2
Answer: Equipments required for gas welding: (Any four ½ mark each) 1) Welding torch 2) Welding tip 3) Pressure regulator 4) Hose and Hose fitting 5) Goggle , gloves and Spark lighter 6) Gas cylinders	2
v) List any four factors governing selection of finishing process.	2
Answer: Factors governing selection of finishing process: (Any four- ½ mark each) i) Shape of surface ii) Minor imperfection in shape iii) Dimensional accuracy iv) Close fit between the contact surfaces v) Fine surface finish vi) Types of Marks on the surface vii) Surface condition viii) Allowable metal loss	2
vi) State the meanings of G90, G91, M05, and M06 ISO codes.	2
Answer: Meanings of G90, G91, M05, and M06 ISO codes (1/2 marks each) G90- Absolute coordinate system (lathe/milling) G91- Incremental coordinate system (lathe/milling) M05- Spindle stop M06- Tool change	2

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vii) State two advantages and two disadvantages of C.N.C. machines.	2
<p>Answer: Advantages of C.N.C. machines: (Any two)</p> <ol style="list-style-type: none"> 1) Reduced lead time. 2) Elimination of operator's errors. 3) Lower labour cost. 4) Flexibility in changes of component design. 5) Reduced inspection. <p>Disadvantages of C.N.C. machines: (Any two)</p> <ol style="list-style-type: none"> 1) Higher investment cost 2) Higher maintenance cost. 3) Higher personnel costs. 4) Planned support facility is required 	1
viii) State any four forgeable materials.	2
<p>Answer: Forgeable materials: (1/2 marks each)</p> <ol style="list-style-type: none"> i. Aluminium & its alloys ii. Copper & its alloys iii. Magnesium & its alloys iv. Tungsten & its alloys v. All types carbon steels vi. Stainless steels 	2
1. b) Attempt any TWO of the following :	8
i) State any four operations carried out in forging process and describe fullering with neat sketch.	4
<p>Answer:</p> <p>Operations carried out in forging process:</p> <ol style="list-style-type: none"> a) Upsetting: Upsetting or heading is the process of increasing the thickness of a bar & reducing the length. b) Drawing Down: It is the process of increasing the length of a bar & reducing its size or thickness c) Setting down: It is a localized drawing-down or swaging operation. d) Welding: A forge weld is made by hammering together the ends of two parts which have been formed to the correct shape and heated to a welding temperature in a furnace. e) Bending: Bending may be done over the edge of the anvil face, over the anvil horn and in special forms such as the swage block edges. f) Cutting: Cutting is a form of chiselling. In this operation a long piece of stock is cut into several specified lengths, or a forging is separated from its stock g) Punching : It is the process of producing the holes by using a hot punch over the pitched hole of the anvil 	2
<p>Fullering:</p>  <p style="text-align: center;">Figure: Fullering operation</p>	1

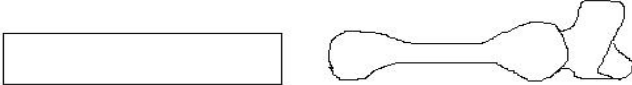
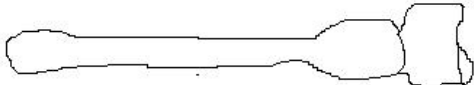
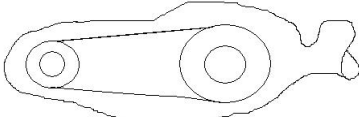
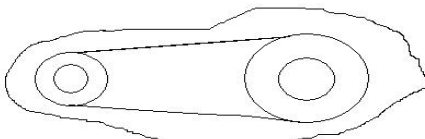


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<p>In fullering, the material cross section is decreased and length is increased. Figure shows that the bottom fuller is kept in the anvil hole with the heated stock over the fuller. The top fuller is then kept above the stock and then with the sledge hammer. The force is applied on the top fuller which results in decreasing the cross section at that point.</p>	1
<p>ii) State two advantages and two disadvantages of closed die forging process.</p>	4
<p>Answer: Advantages of Closed die forging process (Any two)</p> <ol style="list-style-type: none"> 1) Complex shaped parts can be forged 2) Mass production with greater accuracy is achieved. 3) It is very easy to maintain close tolerances. 4) Relatively good utilization of materials. 5) Does not require highly skilled operator. 6) Better reproducibility. 7) Machining is not necessary to obtain final shape. <p>Disadvantages of Closed die forging (Any two)</p> <ol style="list-style-type: none"> 1) Initial cost of die is high. 2) High tool maintenance. 3) No cored 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 	2
<p>iii) Describe the forging sequence for production of connecting rod.</p>	4
<p>Answer: Forging sequence for production of connecting rod:</p> <ol style="list-style-type: none"> 1) Fullering -The heated stock is elongated by reducing its cross section in first die. <div style="text-align: center;">  </div> 2) Edging- The metal is redistributed, increasing the cross section at certain places and reducing at others as required filling the cavities of the die. <div style="text-align: center;">  </div> 3) Blocking - General shape is given in first blocking die. <div style="text-align: center;">  </div> 4) Impression die- Finished shape is given to forging in final impression die. <div style="text-align: center;">  </div> 	4

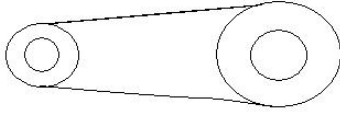
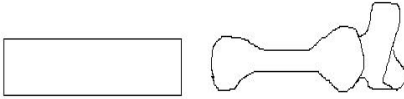
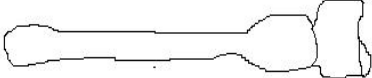
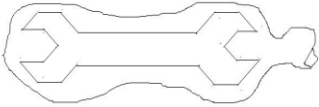
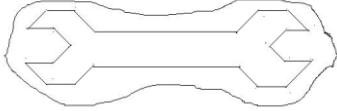
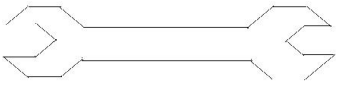


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<p>5) Flash is removed.</p>  <p>6) Heat treatment and machining is done as per requirement.</p>	
<p>2. Attempt any FOUR of the following :</p>	16
<p>a) State any four limitations of forging process.</p>	4
<p>Answer: Limitations of Forging process: (Any four- 1 mark each)</p> <ol style="list-style-type: none"> 1) Initial cost of die is high. 2) High tool maintenance. 3) No cored 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 	4
<p>b) Describe forging sequence for spanner.</p>	4
<p>Answer: Forging sequence for spanner:</p> <p>I. Fullering -The heated stock is elongated by reducing its cross section in first die.</p>  <p>II. Edging -The metal is redistributed, increasing the cross section at certain places and reducing at others as required filling the cavities of the die.</p>  <p>III. Blocking -General shape is given in first die.</p>  <p>IV. Impression -Finished shape is given to forging in final impression die.</p>  <p>V. Flash is removed.</p>  <p>VI. Heat treatment and machining is done as per requirement.</p>	4

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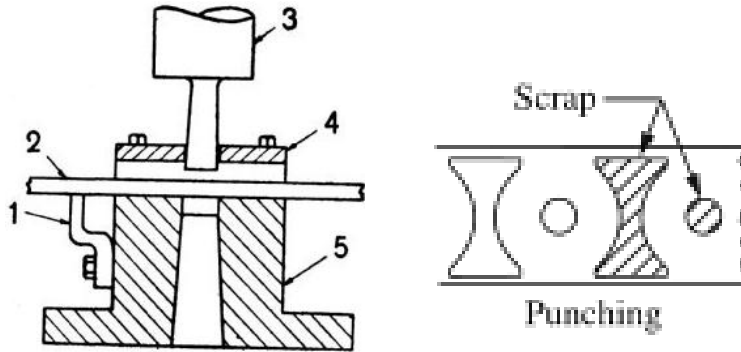
c) Describe punching operation with neat sketch.

4

Answer: **Punching operation:**

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.

2



2

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

Figure: Punching Operation

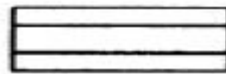
d) Describe slitting and lancing operations.

4

Answer:

Slitting operation: The slitting is the operation of cutting a sheet metal in a straight line along the length.

1

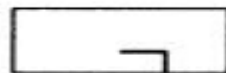


Slitting

1

Lancing operation: The lancing is the operation of cutting a sheet metal through part of its length and then bending the cut portion.

1



1



Lancing

e) State any four advantages of hydraulic press.

4

Answer: **Advantages of hydraulic press** (Any four -1 mark each)

- 1) More versatile and easier to operate.
- 2) Tonnage capacity adjustable from zero to maximum.
- 3) Constant pressure can be maintained throughout the stroke.
- 4) Force and speed can be adjusted throughout the stroke.
- 5) More powerful than mechanical press.
- 6) Safe as it will stop to a pressure setting.
- 7) Stroke can be varied to any length within the limits of hydraulic cylinder travel.
- 8) The press can exert its full tonnage at any position of the ram stroke.

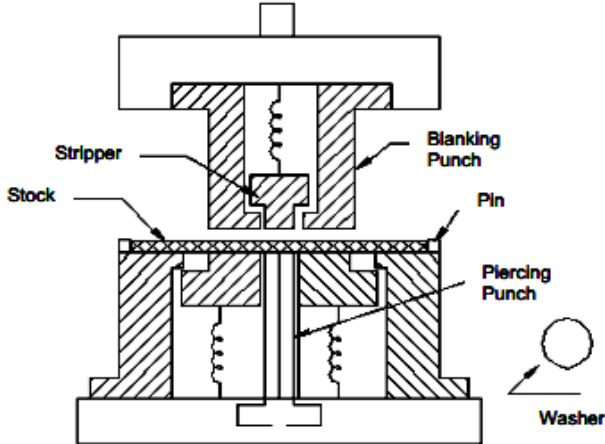
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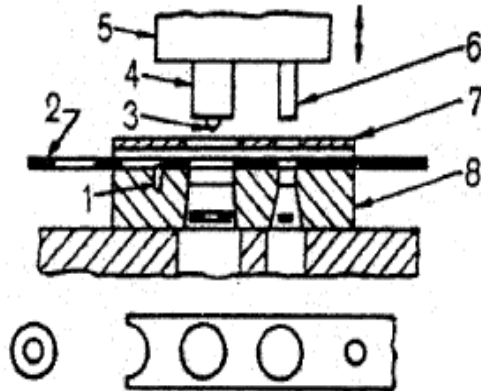
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f) Define "Press work" and list any four automotive components produced by press work.	4
<p>Answer:</p> <p>Press work: In the press work the metal forming machine tool designed to shape or cut metal by applying mechanical force or pressure. Metal is formed to the desired shape without removal of chips.</p> <p>Four automotive components produced by press work: (Any four-1/2 mark each) Washer, switch panels, automotive body panels, motor cover bracket, steel net, cage, filters, fuel tank, filter cap, brackets, wheel rims, cover plates, clamps, frames, channels, side panel, door panels, bonnets, fenders.</p>	2 2
3. Attempt any FOUR of the following:	16
a) Describe "plain washer" making process using combination die.	4
<p><i>Answer: (Note: The plain washers can be produced by using Compound die or Progressive die. It is not possible to use combination die for making plain washers, so consider compound die or progressive die for answer. However credit should be given to any other suitable answer using combination die.)</i></p>	
Compound Die:	
 <p style="text-align: center;">Compound Die</p>	2
<p>Figure shows a simple compound die in which a washer is made by one stroke of the press. The washer is produced by blanking and piercing operations. Simultaneous blanking and piercing is achieved by providing blanking and piercing element in both the member of die, i.e. the upper and the lower member of the die. These elements are set exactly opposite to each other so that piercing punch acts in the opposite direction with respect to the blanking punch. In this way blanking and piercing Operations are performed simultaneously.. The flatness of the blank is achieved during cutting operation by knock out plate.</p>	2
OR	
Progressive die for making plain washer:	
<p>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>	2

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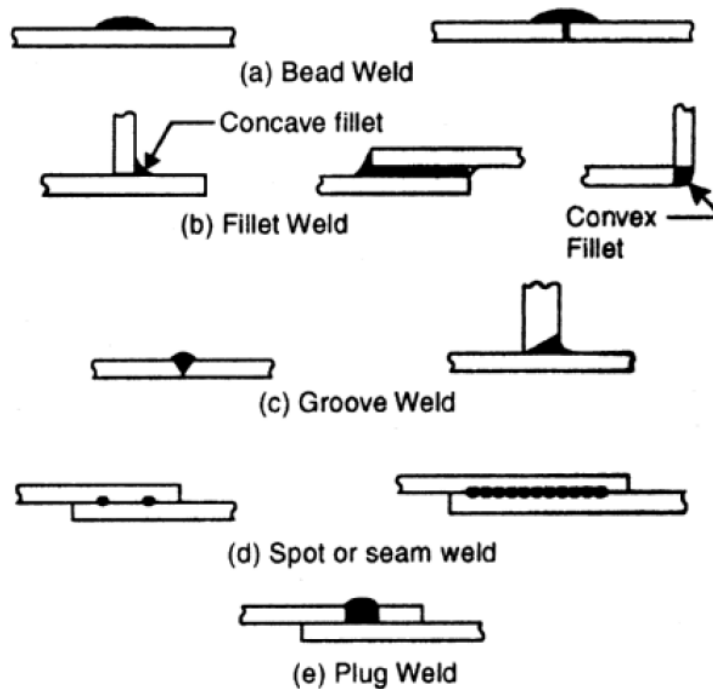
1. Stop 2.sheet metal 3.pilot 4.blanking punch 5.ram 6.piercing punch 7.stripper 8.die

2

b) Sketch and name any four types of welds.

4

Answer: **Types of Welds:**(Any four- 1 mark each)



4

c) Describe a joining process with which a carbide tip can be joined to tool shank.

4

Answer: **Joining process with which a carbide tip can be joined to tool shank:** (Note- Sketch is not necessary)

Brazing is used for joining a carbide tip to the tool shank. It is a Process of joining the metals by melting filler metal only and without melting of base metal. The melting point of filler metal is above 450°C up to 850 °C. The filler metal is called as spelter. Filler material is generally brass. Borax is most common brazing flux. In this process parts to be joined are carefully cleaned, flux is applied and the parts are clamped in position for joining. The parts are heated to a temperature above melting point of filler metal (spelter to be used) and the molten spelter is allowed to flow by capillary action into the space between the parts. On cooling strong joint is obtained. Depending on heating method brazing processes are classified as Torch brazing, Furnace brazing, Resistance brazing, Diffusion brazing etc

4

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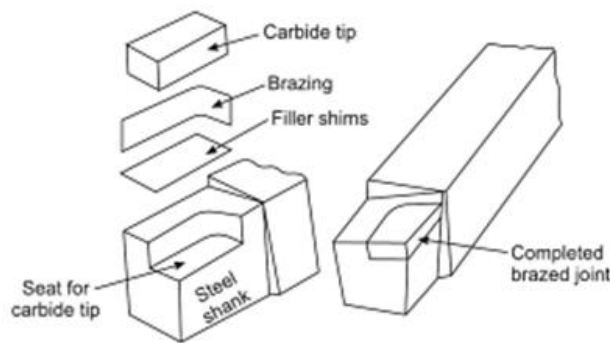
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OR

Tipping of tool bits: Tool bits are small piece of cutting tool materials such as tungsten carbide or ceramic. Bits are ground to proper shape and size. These bits are either held with the clamps or welded on a tool shank of cheaper material like medium carbon steel. The tool bit is attached on the tool shank by either welding or brazing. The brazing is more common. Thin copper strips are used as brazing material. Other brazing material include brazing foils having a layer of copper in the middle and brazing material (tin) on the two sides of the same. Silver solder is sometimes used for joining carbide tips and is good for low temperature brazing, to avoid warping or damage to tool shank. The brazing filler metal in the form of shims is placed on the seat of the tool bit and also on the sides. After applying flux, the assembly is clamped properly and kept in the furnace. The brazed joint is later cleaned.

4



Tipping of a lathe tool by brazing a carbide tip (or tool bit) on steel shank.

d) Distinguish Arc and Resistance welding process. (At least four points)

4

Answer: (Any 4 points -1 mark each)

Arc welding	Resistance Welding
1) It is fusion welding process.	1) It is plastic welding process.
2) Arc is produced by heating with an electric arc without application of pressure with or without application of filler material.	2) In this type, heat is obtained due to resistance to flow of current by the work and application of pressure.
3) Filler material may be used.	3) Filler material is not used.
4) Low welding speed	4) High welding speed.
5) No external pressure is required	5) External pressure is required.
6) Reliability and reproducibility depend on skill of worker	6) Reliability and reproducibility does not depend on skill of worker.
7) Skill operator is necessary	7) less skill operator can do the job.
8) Supply can be A.C or D.C.	8) Supply is A.C only.
9) In some arc welding inert gas are used	9) Inert gases are not used.
10) Striking voltage is high	10) voltage require is low

4

e) State role of fluxes and filler metals in joining processes and state two examples of each.

4

Answer:

Role of fluxes in joining processes:

- i) A flux is a material used for removal of oxides and other undesirable substances.
- ii) Flux is a material used to prevent dissolve or facilitate removal of oxide.
- iii) During welding, flux chemically reacts with the oxides and a slag is formed that floats to and covers the top of the molten puddle of metal and thus keep put atmospheric oxygen and other gases.

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Examples: (Any two)

The flux material is fusible and nonmetallic. Fluxes are available in powder, paste or liquid

- 1) For welding aluminum and its alloy: - Flux may contain potassium chloride, lithium chloride etc.
- 2) For welding Copper and copper alloy:- Borax (fused), di-sodium phosphate, magnesium silicate, lime etc
- 3) For welding ferrous metal :- Mixture of borax, sodium carbonate and potassium bicarbonate; sodium carbonate and sodium bicarbonate; borax ,sodium carbonate and sodium nitrate or borax alone used as flux
- 4) For welding carbon steel:- Dehydrated borax and calcium oxide dissolved in liquid
- 5) For welding alloy steel:- Mixture of boric acid , Dehydrated borax and calcium fluorides

1

Role of filler metals in joining processes:-

Filler metal is added to the weld pool for filling the gap. Filler metal forms an integral part of the weld. Filler rods have same or nearly same chemical composition as that of base metal.

1

Examples: (Any two)

Filler metal is usually available in rod form. These rods are called filler rods.

- 1) Copper coated mild steel - for mild steel and wrought iron welding
- 2) High carbon steel – Building up and repair of cutting edges of paper and leather cutters
- 3) 3% nickel steel - Building up worn camshaft, shaft and gears
- 4) Wear resisting alloy steel - Building up worn crossing and rail ends on railway or tracks, Crushing tools.
- 5) Pipe welding rods:- welding steel pipes
- 6) Stainless steel decay resistant - welding austeniting stainless steel tubes ,sheets, tanks etc
- 7) Super –silicon cast iron :-welding cylinder blocks, lathe beds
- 8) copper – silver alloy :-welding copper fire boxes and electrical work
- 9) Nickel bronze :-brazing steel or malleable iron
- 10) Aluminium alloy 5% copper - welding aluminium casting
- 11) Aluminium alloys 5% silicon - welding pure aluminium sheet, tubes etc.

1

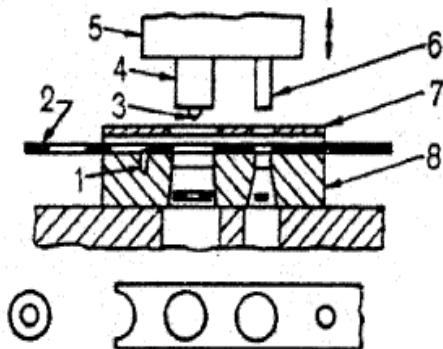
f) Describe working of progressive die with neat sketch.

4

Answer: Working of 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.

2



2

1. Stop 2.sheet metal 3.pilot 4.blanking punch 5.ram 6.piercing punch 7.stripper 8.die

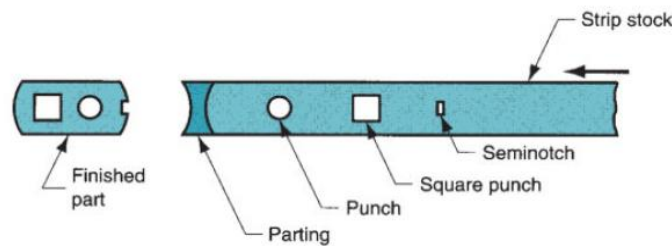
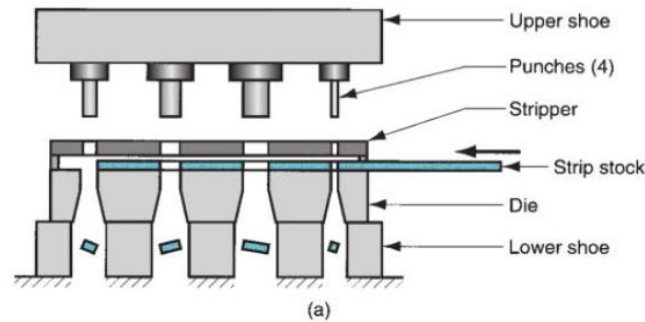
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OR



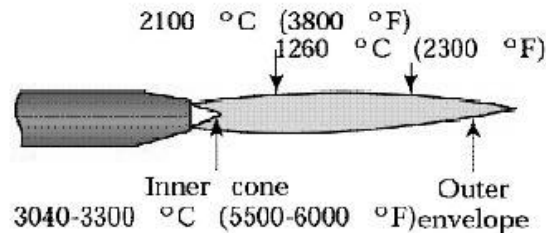
4. Attempt **any FOUR** of the following.

a) Describe any two types of flames and state their applications.

Answer: **Types of flames:** (Any two - $1\frac{1}{2}$ mark for type and $\frac{1}{2}$ mark for application each)

a) **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.

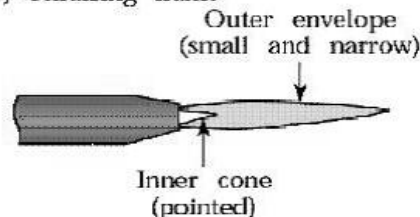
(a) Neutral flame



Applications: Steel, Stainless steel, Cast iron, Copper, Aluminium etc.

b) **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.

(b) Oxidizing flame



Applications: Copper base metal like Brass & bronze, zinc base metal, a few types of ferrous metal such as manganese steel and cast iron

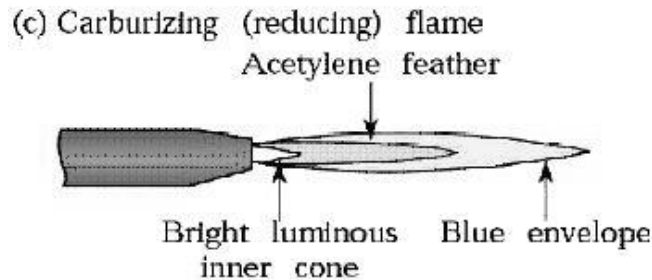
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- c) **Carburizing Flame:** A carburizing flame is one there is an excess of acetylene. The flame has three zones
- 1) Sharply defined inner cone
 - 2) An intermediate cone of whitish colour.
 - 3) Bluish outer cone



Applications: High carbon steel, non ferrous alloy.

- b) Describe honing and state its two applications.

Answer:

Honing is mostly used for finishing round hole by means of bonded abrasive stones called hones. It is used to correct roundness, taper, tool marks and axial distortion .Honing stone made from common abrasives and bonding material with sulphur, resin or wax to improve cutting action and tool life. When honing is done manually tool is rotated and work piece is passed back and forth over the tool .For precision honing tool is given slow reciprocating motion as it rotates .Honing tool is loosely held in holders ,cemented into metal shells which are clamped in holders .Some stones are spaced at regular intervals around holders. Honing tool may be made such that floating action between work and tool take place and pressure exerted on tool may be transmitted equally to all sides. Coolants are essential to remove small chips and keep temperature uniform.

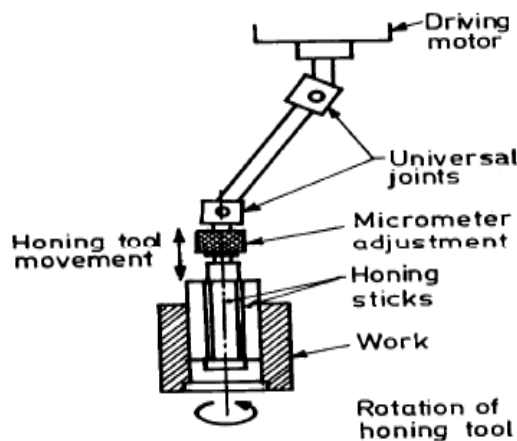


Fig. Honing.

Applications:- (Any two)

Engine cylinder, bearings, gun barrels, ring gauges, shafts and flange faces, piston pin, automobile crankshaft journals etc.

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c) Describe tumbling process and state its two applications.

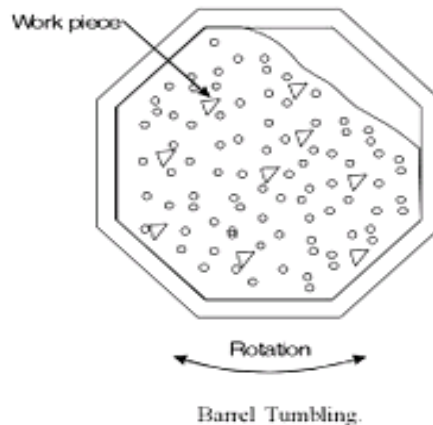
4

Answer: Tumbling process: (*Description :-3marks Application:1 mark, diagram not necessary*)

Tumbling process is used for removing rust and scale from metal parts. In this dry abrasive (deburring compounds) are effective for removing rust and scale from small parts of simple shapes. However parts with complex shapes, with deep recess and other irregularities, cannot be descaled uniformly by tumbling. It may require several hours if the method is used.

3

The operation is accomplished by placing workpieces in a drum or barrel, and totally filled together with stars, jacks slugs or abrasive materials. The material can be sand, granite chips, slag. In operation, the barrel is rotated, and the movements of the workpiece and accompanying slugs or abrasive material against each other produces by friction a fine cutting action which removes the fins, flashes and scale from the product. Parts configuration and size are the primary limitations of the process



Applications:- (Any two)

Screw machine parts, jewelry, medical parts, fasteners like bolts and screws, for cleaning small iron and steel castings of simple and compact shapes, thick-wall medium-size castings of not complex shapes, all kinds of forgings, any steel parts of small sizes and compact shapes, jet engine blades in the aerospace industry, Gears, Sport Utility Devices, springs, clips, washers, , hooks etc.

1

d) Compare electroplating with metal spraying.

4

Answer: Comparison of electroplating with metal spraying: (*Any four point 1 mark each*)

Electro plating	Metal spraying
1) Electroplating is an electrolytic process of covering surface or object usually metallic with a thin adherent coating of the same or other metal by electrolysis.	1) Metal spraying or metalizing means to treat with, especially coat with a metal to impregnate with a metal or metallic compound.
2) Impact toughness of coated product is better.	2) Impact toughness of coated product is good.
3) Corrosion resistance of coated product is good	3) Corrosion resistance of coated product is better.
4) Thermal resistance of coated product is not good.	4) Thermal resistance of coated product is good
5) Hardness of coated product is good	5) Hardness of coated product is better
6) Porosity of coated product is less	6) Porosity of coated product is more
7) Bonding of coated product is more	7) bonding of coated product is less
8) Lubrication of coated product is good	8) Lubrication of coated product is very good
9) Thickness of the metal layer is thin	9) Thickness of the metal layer is more

4

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10) In this an aqueous solution of acids, bases or salts.	10) In this an aqueous solution of acids, bases or salts. are not used
11) Anode is generally made of metal being plated so it serves as source of coating metal.	11)The metal used for deposition may be either in the form of wire or powder
12) No need to atomize the metal to be coated.	12) Coating metal is atomised before spraying it under pressure on the metal substrate.
13) Compressed air is not used	13)Compressed air is used to atomise and spray the molten metal on to the surface of workpiece
14) No need to use gas flame.	14)A gas flame is used as usual to melt the powder

e) Describe incremental co- ordinate system

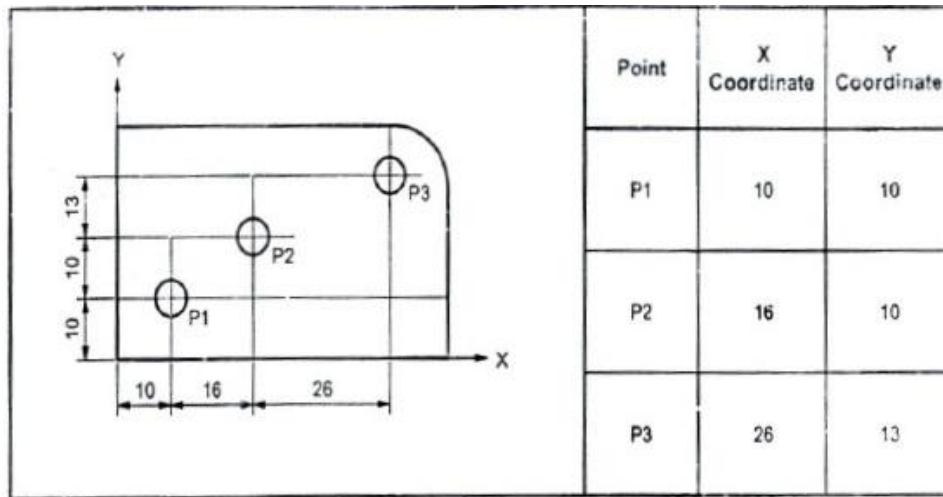
4

Answer:(Sketch With example- 2 mark, description : 2 mark)

Incremental co- ordinate system

In incremental system the co-ordinates of any point are calculated with reference to previous point i.e. the point at which the cutting tool is positioned is taken as datum point for calculating the co-ordinates of next point to which the movement is to be made. It is difficult to check a part program written on incremental dimension mode. The G-code used for incremental programming is G-91.

2



2

f) Classify C.N.C. machines.

4

Answer: **Classification of CNC Machines: (Any 4 - each carry 1mark)**

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

4



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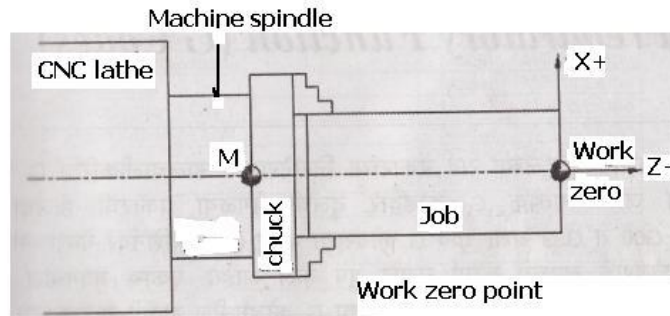
<p>C. According to programming methods: 1) Absolute programming method 2) Incremental programming method</p> <p>D. According to type of controller: 1) NC based controller system 2) CNC based controller system</p>																				
<p>5. Attempt any FOUR of the following :</p>		16																		
<p>a) Distinguish between NC and CNC machines.</p>		4																		
<p>Answer: (Any four -1 mark each)</p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>NC System</th> <th>CNC System</th> </tr> </thead> <tbody> <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> </tbody> </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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<p>b) State salient features of open – loop and closed –loop system.(At least two of each)</p>		4																		
<p>Answer:</p> <p>Open loop Control system :- (2 points)</p> <ul style="list-style-type: none"> • There is no comparison between actual and desired values. • An open-loop system has no self-regulation or control action over the output value. • Each input setting determines a fixed operating position for the controller. • Changes or disturbances in external conditions does not result in a direct output change.(unless the controller setting is altered manually) • It is less costly. • This system gives less accurate positioning. • This type of system, servomotors are not used. • It is simplest than close loop system. • In this feedback mechanism is not used. • In this system, comparison not takes place with input signal. <p>Closed Loop Control System:- (2 points)</p> <ul style="list-style-type: none"> • It is more costly. • It is complex than open loop system. • These system gives more accurate positioning. • This types of system, servomotors are used. • In this feedback mechanism is used. • In this system, comparison takes place with input signal. 		2																		
		2																		

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e) Describe meaning of each of the constituent of block format.

4

Answer:

N_ G_ X_ Y_ Z_ R_ F_ S_ T_ M_ EOB

N: Every block has given number according to tool path. Numbers from 1 to 9999 can be used.
e.g. N05

4

G: For preparatory functions i.e. for all type of tool movement, codes obtained by address G are used. G code is followed by coordinates of X, Y and Z axes. e.g. G00

X, Y, and Z: These addresses are used to represent the distances traveled by tool with respect to axes. e.g. X20, Y50 and Z-20.

R: Radius for curvature is given by address R it is also used to give parameters. e.g. R20 or R4=56.

F: This address is used to give feed. It can be given as mm/min or mm/rev. e.g. F80 or F0.8

S: To give spindle speed, this address is used. e.g. S500

T: The tools in the magazine or in turret head are numbered. Address T is followed by tool number in the turret head or tool magazine. e.g. T05

M: For miscellaneous functions or all activities except tool movement's M codes are used.

e.g. M05

EOB: This sign is used to represent end of block.

f) State application of following processes (Any one application of each)

4

- i) Abrasive blast cleaning.
- ii) Galvanizing
- iii) Burnishing
- iv) Acid pickling

Answer: (Any one application of each- 1mark)

1) Abrasive blast cleaning: It is used for -
cleaning engine blocks, crankshafts, castings of different shapes and size, railroad cars, car wheels, oil and gas pipes, steel strip.

1

2) Galvanizing: It is used for -

all forms of outdoor structural parts, pipes, sheeting for roofs, walls of building, wash tubs, ash cans, all sort of containers, telegraph wire, fencing materials, Transformer parts etc.

1

3) Burnishing : It is used for -

Hydraulic system components, Seals, Valves, Spindles, Fillets on shaft.

1

4) Acid pickling:

1) Automotive Hot rolled acid pickled products mainly used for auto chassis systems, frame and beam, wheels including rims, carriage sheet of trucks, stamping parts, bumper guard, brake cable

1

(2) Machinery Including: textile machines, mine machines, windmill and generic machines.

(3) Household apparatus, frames, holders for compressors, chemical cans, etc.

(4) Others Components- bicycle parts, welded pipes, electrical cabinets and various stamping parts.



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6. Attempt any TWO of the following.

16

a) Write a part program for following component. Assume suitable data if required Ref. Figure No.1

8

Answer:

Point	X	Z	R
0	0	2	
1	0	0	
2	24	0	
3	30	-30	
4	30	-60	
5	36	-63	3
6	36	-100	
7	40	-100	
8	40	-110	

O1234 EOB

N10 G71 G90 G94 EOB

N20 T0101 S1000 M03 EOB

N30 G00 X0.0 Z 2.0 M08 EOB

N40 G01 X0.0 Z0.0 F200 EOB

N50 X24.0 EOB

N60 X30.0 Z-30.0 EOB

N70 Z-60.0 EOB

N80 G03 X36.0 Z-63.0 R3.0 EOB

N90 G01 Z-100 EOB

N100 X40.0 EOB

N110 Z-110 EOB

N120 G00 X45.0 Z20.0 EOB

N130 M05 M09 EOB

N140 M30 EOB

2

4

2

OR

N	G	X	Z	F	M	S	T
N00	G90						
N01	G71						
N02	G93				M41	S1500	
N03	G94						
N04	G28	X0	Z0				
N05					M06		T0101
N06					M03		
N07	G00	X21	Z1		M08		
N08	G00	X12	Z1				
N09	G00	X12	Z0				
N10	G01	X15	Z-30	F0.25			
N11	G01	X15	Z-60				
N12	G03	X18	Z-63	I-3			
N13	G01	X18	Z-100				
N14	G01	X20	Z-100				
N15	G01	X20	Z-110				
N16	G00	X21	Z1				

8



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N17	G00	X0	Z1				
N18	G28	X0	Z0				
N19					M05		
N20					M09		
N21					M02		
N22					M30		

b) Write a part program for following component. Ref. Figure No.2. Assume suitable data if required.

8

Answer:

POINT	X	Y	Z	R
0	0	0	5	
1	50	50		
2			-52	
3			2	
4	0	0		
5			-50	
6	80	0		
7	100	20		20
8	100	80		
9	80	100		20
10	20	100		
11	0	80		
12	0	0		
13			5	
14	-25	10	5	

N10 G71 G90 G94 EOB
N20 M06 T0101 S1000 M03 EOB
N30 G42 D02 G00 X0.0 Y0.0 Z5.0 EOB
N40 X50.0 Y 50.0 M08 EOB
N50 G01 Z-52.0 F200 EOB
N60 Z 5.0 EOB
N70 G28 U0.0 V0.0 M09 EOB
N80 M05 EOB
N90 M06 T02 02 EOB
N100 M03 S1500 EOB
N110 G01 X0.0 Y0.0 Z-50.0 F200 M08 EOB
N120 X80.0 Y0.0 EOB
N130 G02 X100.0 Y20.0 R20.0 EOB
N140 G01 Y80.0 EOB
N150 G03 X80.0 Y100.0 R20.0 EOB
N160 G01 X20.0 EOB
N170 X0.0 Y80.0 EOB
N180 X0.0 Y0.0 EOB
N190 G00 Z5.0 EOB
N200 X-25 Y 10.0 EOB
N210 G40 M05 M09 EOB
N220 M30 EOB

2

4

2

OR



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N	G	X	Y	Z	M	S	T
N00	G17						
N01	G71						
N02	G40						
N03	G80						
N04	G28						
N05	G91						
N06		X0	Y0				
N07	G92						
N08					M06		T01
N09	G00						
N10	G90				M03		
N11	G43			Z0	M08	S600	
N12	G00	X00	Y00				
N13	G00	X35	Y20				
N14	G01			Z-50	F0.2		
N15		X00	Y80				
N16		X20	Y100				
N17		X80	Y100				
N18	G02	X100	Y80	I-20			
N19	G01	X100	Y20				
N20	G03	X80	Y00	I-20			
N21	G01	X00	Y00				
N22	G00			Z00			
N23	G00	X50	Y50				
N24	G01			Z-50			
N25	G00			Z0			
N26	G00	X0	Y0		M05		
N27	G40						
N28	G80						
N29	G49						
N30					M09		
N31					M02		
N32					M30		

8

c) Describe with neat sketch – perforating, notching, embossing and coining process.

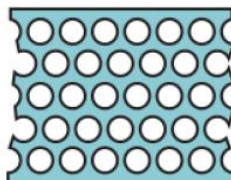
8

Answer: (2 mark each- description 1 mark sketch -1mark each)

1. Perforating:

This is used for making holes. Metal removed from parent metal is called as scrap & parent metal is called as product. It is used for making large number of identical holes on metal sheets. Diameter of the punch is more than thickness of the metal sheets.

1



1

2. Notching:

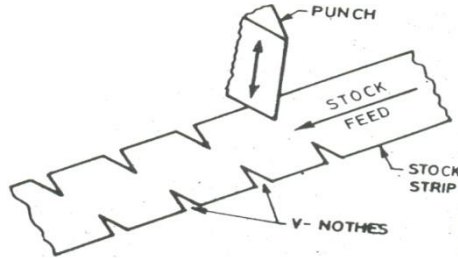
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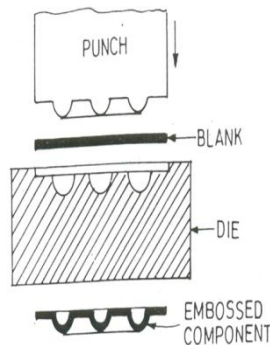
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It similar like blanking operation
But it operated on the edges of the sheet metal



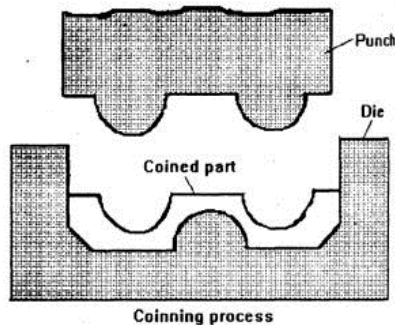
3. Embossing:

It is the process through which specific shapes are produced on sheet metal blanks with the help of punch & dies. It is used for decorative purpose / names, trademarks. Punch operates relatively at low speed to allow metal to stretch



4. Coining process:

The coining is the operation of production of coins, medals or other ornamental parts by squeezing operation.



1

1

1

1

1

1