Important Instructions to examiners:
1) The answers should be examined by key words and not as word-to-word as given in themodel answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may tryto assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given moreimportance.(Not applicable for subject English and Communication Skills).
4) While assessing figures, examiner may give credit for principal components indicated in thefigure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constantvalues 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.

……

	Marks
1. a) Attempt any SIX of the following -	**12**
i) List any two automotive forged components.	2
Answer : *Any Two -1 mark each (Credit Should be given to suitable component)* Following are few automotive components manufactured by forging Process: 1. Connecting rod 2. Crankshaft 3. Camshaft 4. Spanner 5. Alloy wheel	2
ii) List any two application of aluminum as press work material.	2
Answer: *Any Two -1 mark each (Credit Should be given to suitable application)* Following are applications of aluminum as press work material: 1. Automobile body parts 2. Doors 3. Refrigerator trays 4. Electrical fixtures 5. Windows 6. Construction of airplanes	2

iii) Classify fusion welding process.	2
Answer: *Any Four – ½ mark each* Classification of fusion welding process: • Arc welding 1. Carbon Arc Welding 2. Shielded Metal Arc Welding (SMAW) 3. Submerged Arc Welding (SAW) 4. Metal Inert Gas Welding (MIG, GMAW) 5. Tungsten Inert Gas Arc Welding (TIG, GTAW) 6. Electroslag Welding (ESW) 7. Plasma Arc Welding (PAW) • Gas Welding (GW) 1. Oxyacetylene Welding (OAW) 2. Oxy-hydrogen Welding (OHW) 3. Air acetylene gas welding • Thermit welding	2
iv) Define welding process.	2
Answer: *Any equivalent definition - 02 marks* **Welding** is a process of joining similar metals by application of heat with or without application of pressure and addition of filler materials. **OR** **Welding** is defined as "a localized coalescence of metals, where in coalescence is obtained by heating to suitable temperature with or without the application of pressure and with or without the use of filler metal.	2
v) List any two chemical cleaning processes.	2
Answer: *Any two - 1 mark each* Depending on cleaning fluids used, the chemical cleaning is named as 1. Alkaline cleaning 2. Acid pickling 3. Electrolytic cleaning 4. Emulsified solvent cleaning 5. Vapour degreasing 6. Ultrasonic cleaning	2

vi) Draw program format for CNC machine**.** — 2

Answer: *Any one -2 mark*

i) Fixed block format

N	**X**	**Y**	**F**	**S**	
001	15.00	20.00	200	500	EOB
002	75.00	20.00	200	500	EOB

ii) Tab sequential format

N	**X**	**Y**	**F**	**S**	
001 TAB	15.00 TAB	20.00 TAB	200 TAB	500	EOB
002 TAB	75.00 TAB				

iii) Word address format

N001	X 15.00	Y 20.00	F 200	S 500	EOB
N002	X 75.00	EOB			

2

vii) Enlist the disadvantages of NC machine. — 2

Answer: *Any Two -1 mark each*

Disadvantages of NC machines

1. High initial cost
2. Higher maintenance cost
3. Higher tooling cost
4. Need for a controlled environment
5. Higher personnel/operator costs

2

viii) Define Forgeability. — 2

Answer: *Any Equivalent definition - 2 marks*

Forgeability can be defined as the tolerance of a metal or alloy for deformation without failure.

OR

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.

2

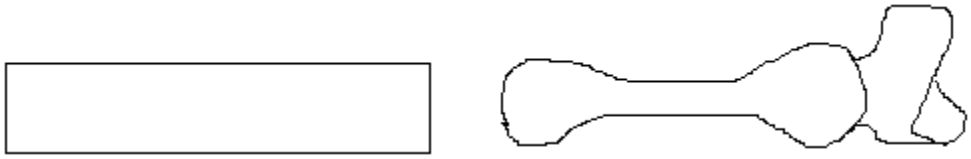
1. b) Attempt any TWO of the following- — **08**

i) Describe with neat sketch forging sequence of spanner. — 4

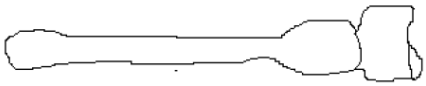
Answer: *Sketch -2 marks, explanation -2 marks* — 4

1) The heated stock is elongated by reducing its cross section in first die.

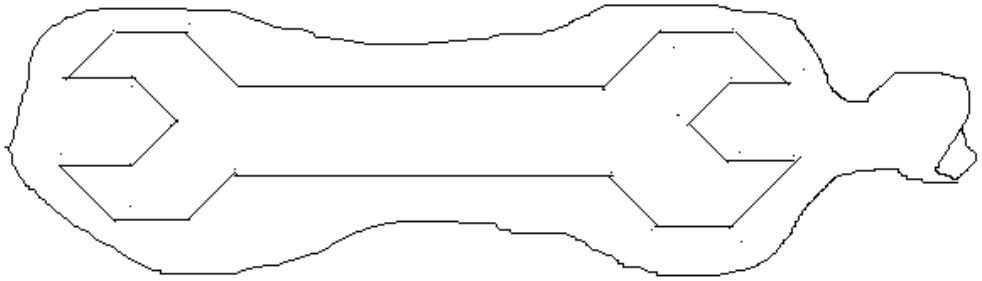
The operation is known as “Fullering”.



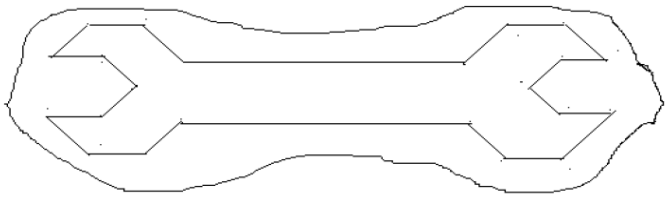
2) The metal is redistributed, increasing the cross section at certain places and reducing at others as required filling the cavities of the die. The operation is known as "Edging".



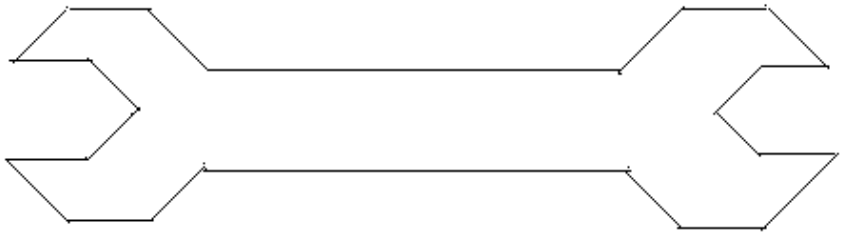
3) General shape is given in first blocking die.



4) Finished shape is given to forging in final impression die.

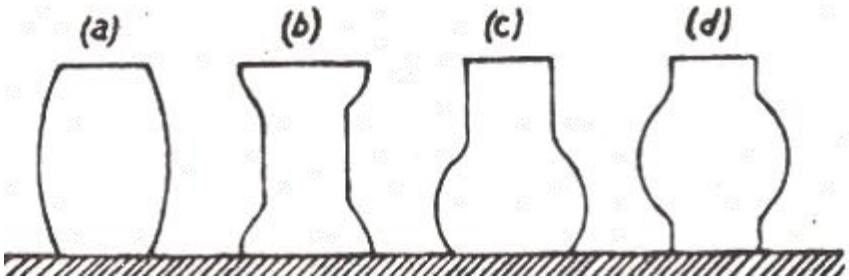


5) Flash is removed.

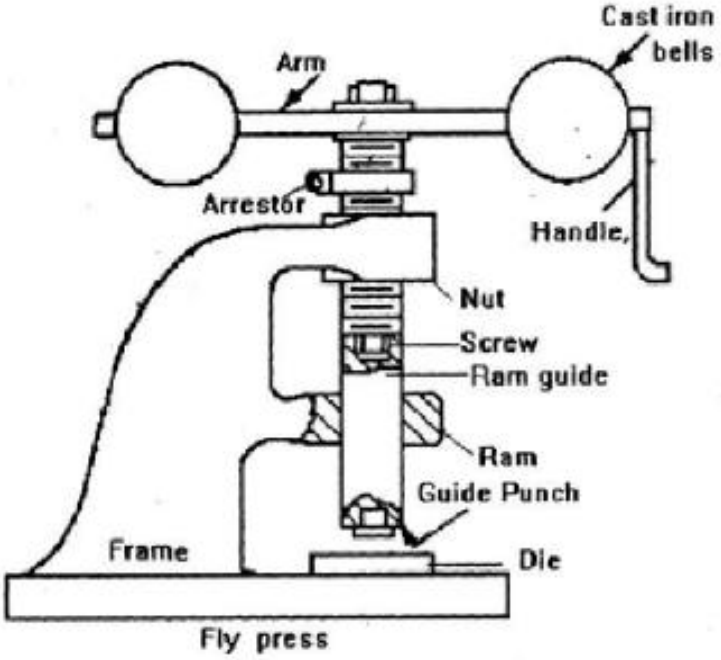
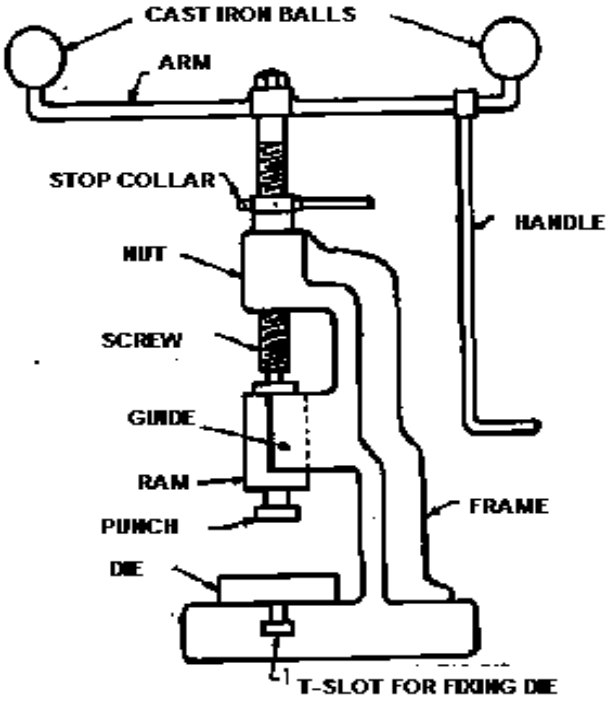


6) Heat treatment and machining is done as per requirement.

ii) Classify forging process.	4
Answer: *Any Four -1 mark each* **Classification of forging processes** *(Any four)* **1.Open die forging:** a) Hand forging b) Power forging: i. Hammer forging ii. Press forging **2.Close die forging:** a) Drop forging b) Press forging c) Machine forging	4
iii) State advantages and limitation of forging process.	4
Answer: *Any Two Advantages & Two Disadvantages – 1 mark each* **Advantages of forging processes (Any Two)** 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. **Limitations of forging processes (Any Two)** 1) Initial cost of die is high. 2) High tool maintenance. 3) Limitation in size and shape. 4) Heat treatment process increases cost of the product. 5) Brittle materials like cast iron cannot be forged. 6) Complex shape cannot be produced by forging. 7) Rapid oxidation of metal surface at high temperature wears the dies.	2 2

2. Attempt any FOUR of the following	16
a) Enlist any four forgeable metals or alloys. Also list properties of forgeable materials.	4
Answer : *Any Four materials - ½ mark each & Any Four Properties - ½ mark each* **Forgeable Materials**: (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. **Properties of forgeable materials:**(Any Four) 1) High Strength 2) Better Malleability 3) Resistance to fatigue, shock or bending 4) Durability 5) Shock or bending resistance 6) Good machining characteristics i.e. Machinability	2 2
b) Describe upsetting and bending operation carried out in forging process.	4
Answer: *Sketch – 2 mark & Explanation – 2 mark* **Upsetting:** Upsetting or heading is the process of increasing the thickness of a bar & reducing its length**.** The pressure is obtained by driving the end of the bar against the anvil, by supporting on the anvil and hitting with the hammer, by placing in swage block hole and hitting with the hammer or by clamping in a vice and then hammering. The figure (a) shows the effect of heavy hammer blows, (b) shows the effect of comparatively light hammer blows. Local upsets are produced as shown at (c) and at (d) by heating only the end or the middle of the bar.  Figure: Upsetting	1 1

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 or for bar stock, by inserting the end in the pritchel hole and bending the bar with a wrench or tong. When metal is bent, the layers of metal on the inside are shortened and those on the outside are stretched. This causes a bulging of the sides at the inside, and radius on the outside of the bend. If a perfect square bend is required, additional metal will go to the make up the corner. Gradual bends are made by using the beak of the anvil or the metal may bent around a bar of correct radius held in a vice. The figure shows the stages in bending a bar over the horn of an anvil using a hammer. It is classified as angular and curvilinear.  Figure: Bending	1 1
c) Classify presses on the basis of i) Source of power ii) Design of frame	4
Answer: : Classification of presses: **According to Source of power to ram:** *(Any Four -1/2 mark each)* 1. Crank 2. Cam 3. Eccentric 4. Power screw 5. Rack and pinion 6. Toggle 7. Hydraulic 8. Pneumatic **According to design of frame:** *(Any Four -1/2 mark each)* 1. Bench 2. Gap 3. Inclinable 4. Arch 5. Straight side 6. Horn 7. Pillar	2 2

d) Draw neat labelled sketch of fly press.	4
Answer: *Sketch -3 mark &labeling -1 mark*  Fly press **OR**  	4

e) Describe with neat sketch pilots and stops.	4

Answer:

Pilots: The pilot illustrated in Figure enables the correct location of the blank when it is fed by mechanical means. The pilot enters into the previously pierced hole and moves the blank to the correct position to be finally spaced by the stops. The pilots are fitted to the punch holders — 1

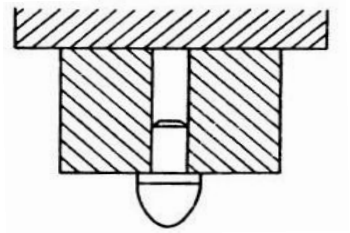
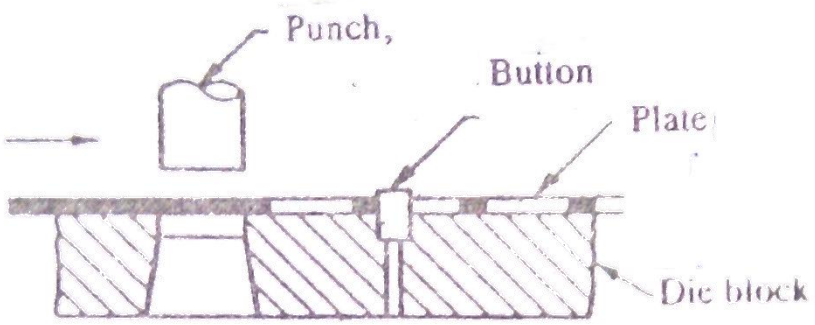


Figure: Pilot — 1

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.

The common types of stops are: *(Any One Type)*

Button stop: The button stop illustrated in figure is the simplest of the designs. A small pin or a button 2 is fixed to the die block 4 at a measured distance from the punch axis. After the end of each cut, the plate 3 is lifted and pushed aside till the edge of the next slot bears against the button 2.This makes the accurate spacing. The button stop is used in hand presses and in slow acting power Presses. — 1

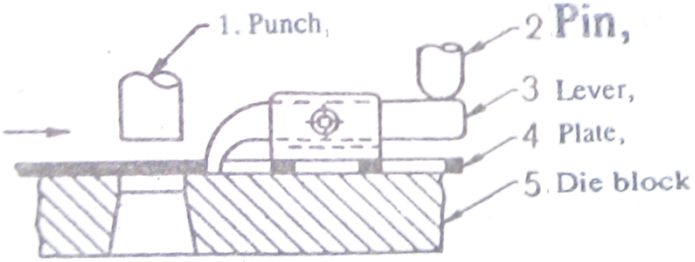


Button stop — 1

OR

Lever stop:

The lever stops shown in fig. is operated by the machine. As punch descends the pin attached to the ram pushes the lever which lifts the lever stop leaving blank free. The plate is pushed aside immediately when the punch starts moving in the upward strokes, and in the next instant the lever is released from the pin pressure that causes the stop to engage with the work making accurate spacing. — 1



Lever stop

1. Punch, 2.Pin, 3. Lever, 4. Plate, 5. Die block

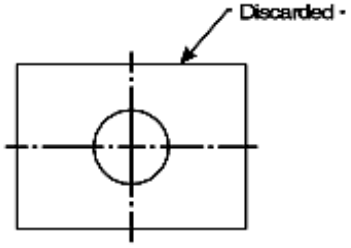
1

f) Explain piercing and blanking press operation. 4

Answer: *Sketch – 2 mark & Explanation – 2 mark*

Blanking:

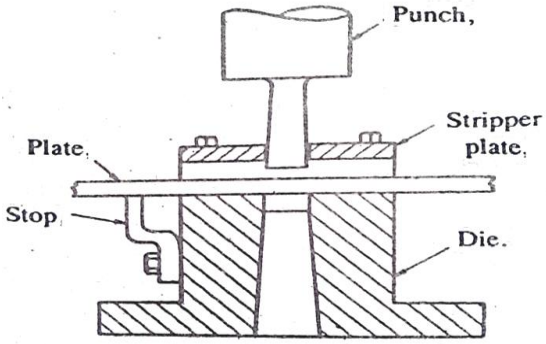
The blanking is the operation of cutting of flat sheet to the desired shape. The piece detached from strip is known a blank. The metal punched out is the required product and the plate with the hole left on the die goes as waste. While blanking the size of the blank is governed by the size of the die and the clearance is left on the punch. Blanking is always performed as the first operation. 1



(a) Blanking 1

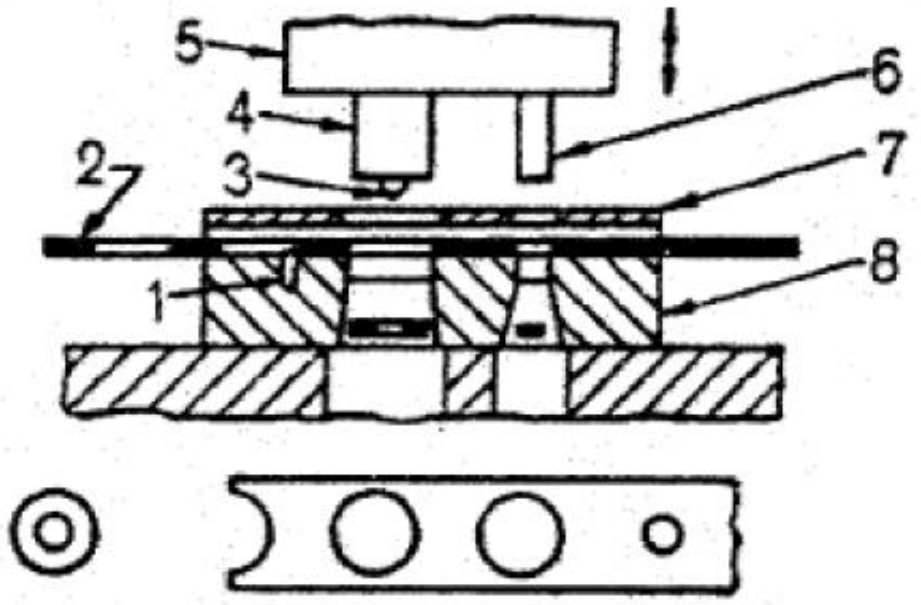
Piercing:

The piercing is the operation of production of hole in a sheet metal by the punch and the die. The materials punched out to form the hole constitute the waste. The punch point diameter in the case of piercing is less than or equal to the work material thickness. The punch governs the size of the hole and clearance is provided on the die. Fig. shows punch and die set for piercing. 1



Punch and die set up for piercing, punching and blanking 1

3. Attempt any FOUR of the following:	16
a) Draw neat labelled sketch of progressive die for blanking and piercing operation.	4
Answer: *Sketch - 3 mark, Labeling -1 mark* **Progressive Die**:	4



1.Stop 2.Sheet metal 3.Pilot 4.Blanking punch 5.Ram 6.Piercing punch 7.Stripper 8.die

OR

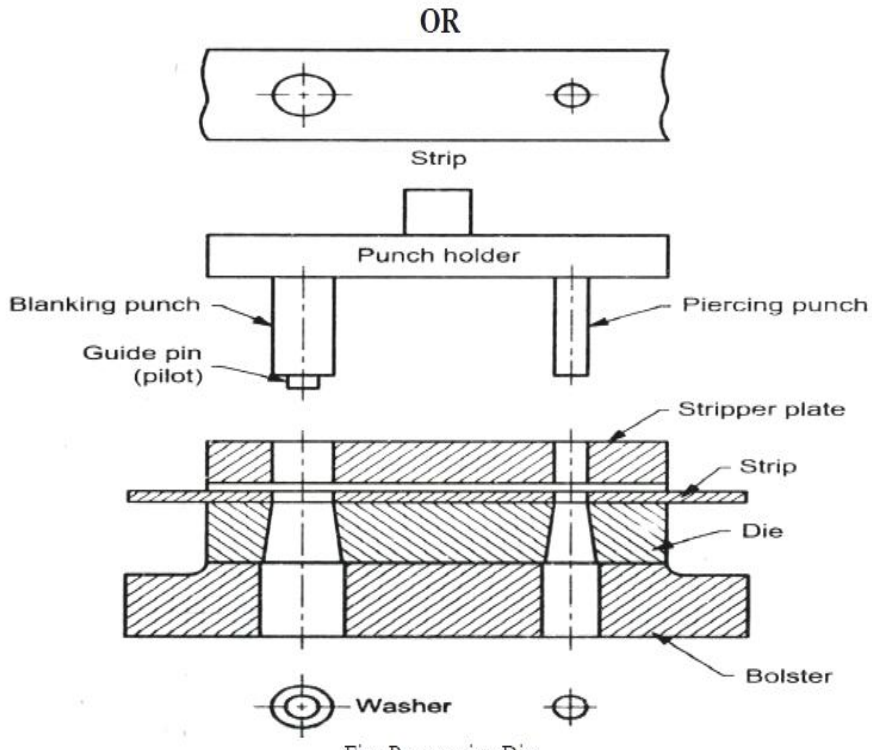


Fig:-Progressive Die

b) Explain types of flames used in gas welding	4

Answer: *List – 1 mark, Explanation – 3 marks. Credit should be given to sketch.*

Types of Flames

1) Neutral Flame
2) Oxidizing Flame
3) Carburizing Flame

1

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 -1) A sharp brilliant inner cone, 2) An outer cone or envelop of bluish colour.

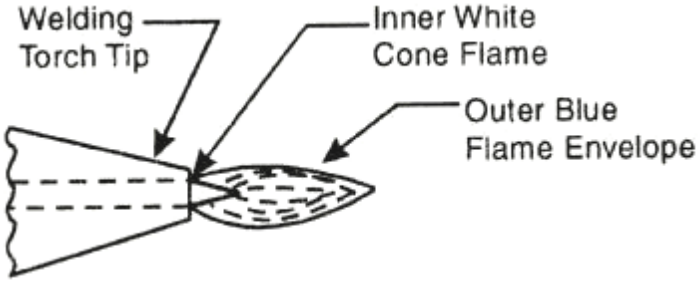


Fig :- Neutral Flame

2) **Oxidizing Flame :-**

3

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

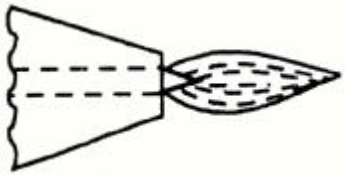


Fig :- oxidizing Flame

3) **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

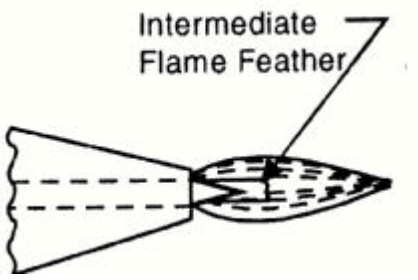


Fig:- carburizing flame

c) Differentiate between TIG and MIG welding process. — 4

Answer: Difference between TIG and MIG *(Any Four - 1 mark each)* — 4

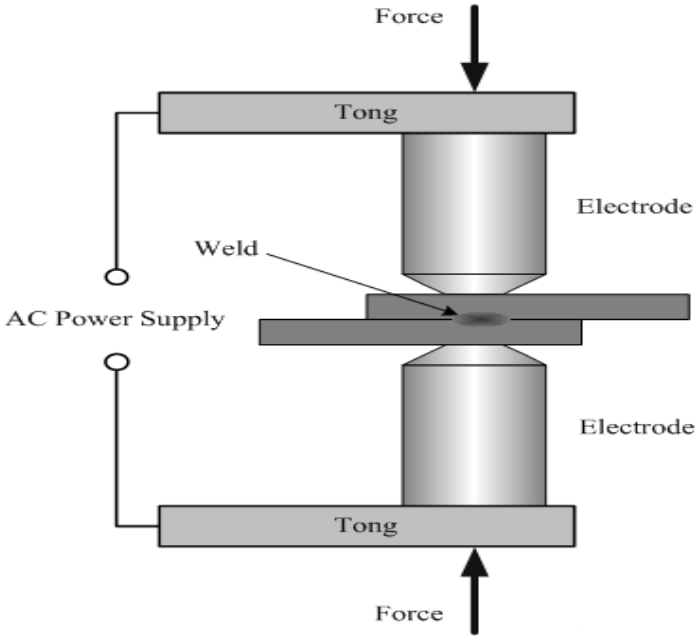
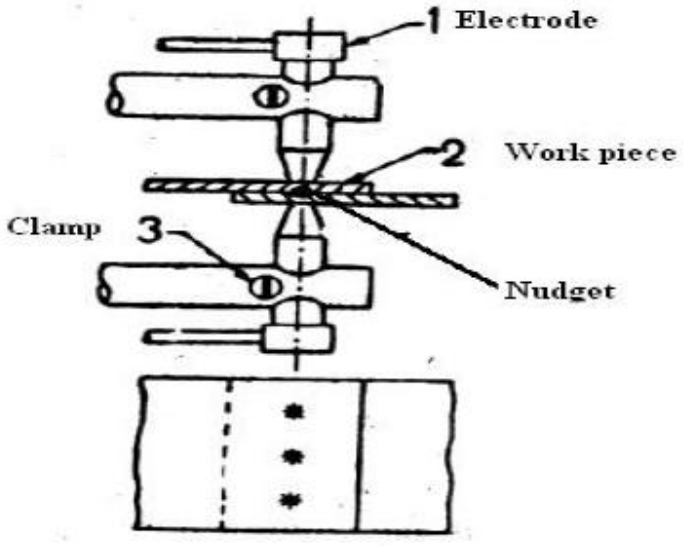
Sr. No.	TIG	MIG
1)	In Tungsten inert gas arc welding, non-consumable tungsten electrode is used	In Metal inert gas arc welding, consumable metallic electrode is used
2)	Both A.C& D.C. can be used	D.C with reverse polarity is used
3)	Filler metal may or may not be used	Filler metal not used as electrode itself serve both purpose of producing arc and filler metal
4)	Not used for welding plates thicker than 6 mm	Best suited for welding jobs thicker than 6 mm
5)	Welding speed slow	Welding speed fast
6)	Electrode feed not required	Electrode need to be feed at constant speed from wire reel
7)	Penetration not so much deeper	Deeper penetration is obtained
8)	Requires skilled operators	No so much is required for operators

d) Enlist any four factors which affect selection of welding process. — 4

Answer: Any four - 1 mark each — 4

Factors affecting selection of welding processes:

1. material grade, material thickness, design, weld property requirement
2. equipment type, edge preparation design
3. tip / work piece distance, electrode angle
4. current, arc voltage, welding speed
5. Availability of equipment
6. Repetitiveness of the operation
7. Quality requirements (base metal penetration, consistency, etc.)
8. Location of work
9. Materials to be joined i.e. base metal composition
10. Appearance of the finished product
11. Size of the parts to be joined
12. Time available for work
13. Skill experience of workers
14. Cost of materials
15. Code or specification requirements
16. Mechanical properties desired in joints

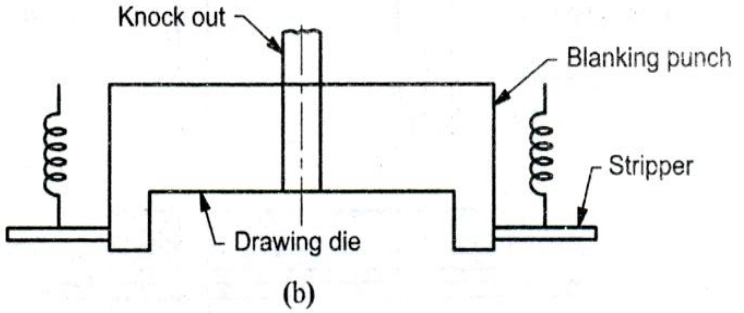
e) Describe with neat sketch resistance spot welding.	4
Answer: *Sketch - 2 marks, Explanation - 2 marks* **Resistance Spot welding:** Spot welding is employed to join overlapping strips, sheets or plates of metal at small areas .The pieces are assembled between two electrodes, which must possess high electrical & thermal conductivity and retain the required strength at high temperatures, so they are made of pure copper for a limited amount of service, and of alloys of copper or tungsten, or copper and chromium for continuous working. When current is turned on, the pieces are heated at their contacts to a welding temperature, and with the aid of mechanical pressure the electrodes are forced against the metal to be welded.	2
Resistance Spot Welding (RSW)  **OR**  	2

f) Describe with neat sketch combination die.	4

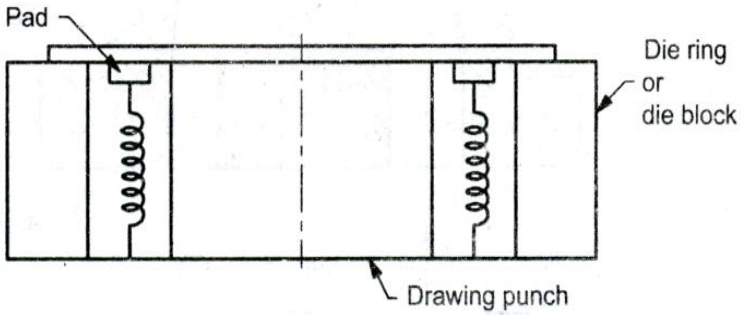
Answer: *Sketch - 2 mark ,Explanation - 2 mark*

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. — 2

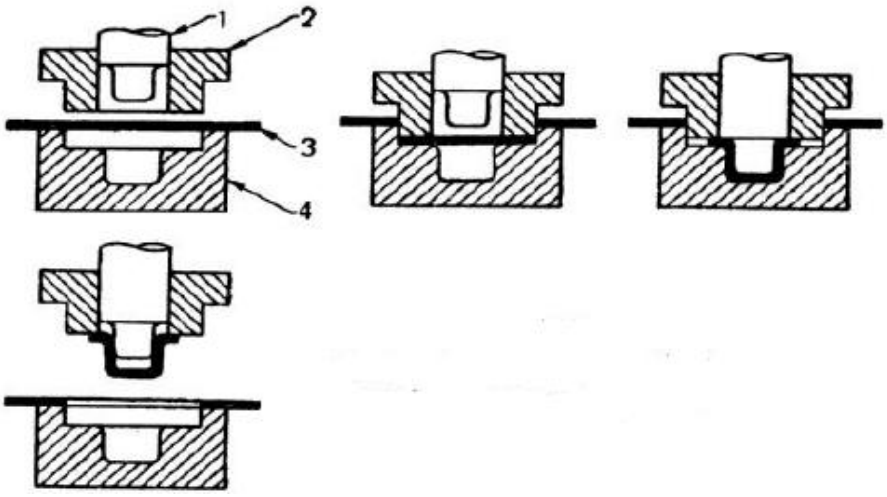


(b)



(c) — 2

OR



1. Drawings punch 2. Blanking punch 3.sheet metal 4.die

Fig : combination die

4. Attempt any FOURof the following: **16**

a) Give comparison between resistance welding 4

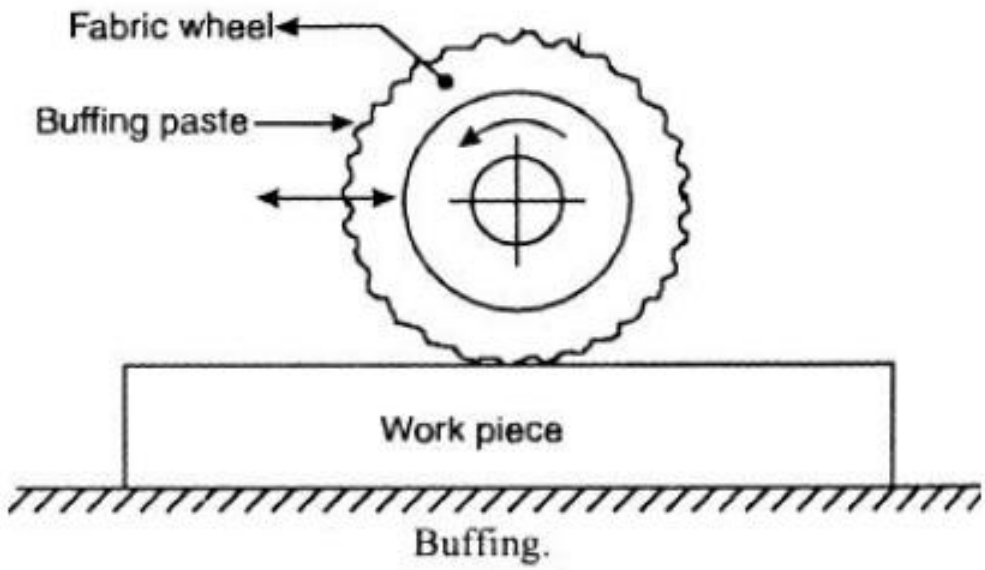
Answer: *Any Four - 1 mark each (Credit should be given to equivalent answer)* 4
(Note :- comparison of resistance welding with other welding processes can be considered**)**

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 welding 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

b) List any four types of surface coating process and also list any four organic coating materialsused in painting processes. 4

Answer:
Surface coating process: *(Any Four -1/2 marks each)* 2

1) Metallic coating
   a) Electroplating
   b) Hot-dipping
   c) Galvanizing
   d) Metal spraying or metallizing
2) Plastic coating
3) Organic coating
4) Inorganic coatings
   a) Enameling of metals
   b) Ceramic coating
5) Conversion coating
   a) Phosphate coatings
   b) Chromate coating
   c) Oxide coating
   d) Anodic coating
6) Other metal coating processes
   a) colorising
   b) Radio-frequency sputtering
   c) Electroless plating

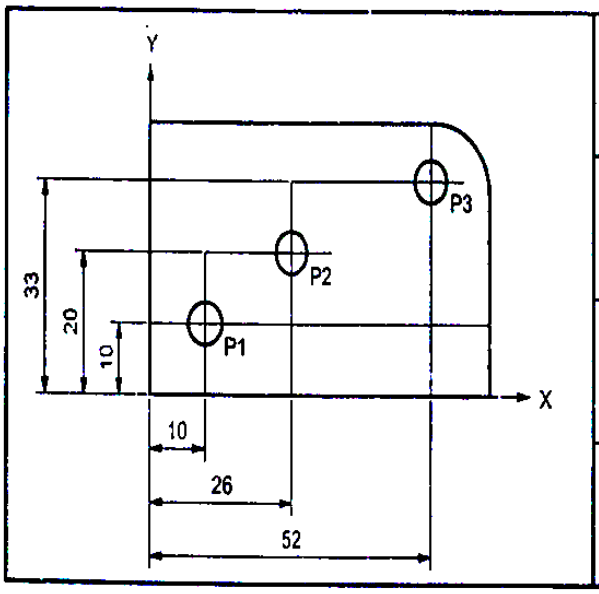
Organic coating materials: (Any Four -1/2 marks each) 1) Oil paints – linseed oil, pigments and turpentine etc. 2) Enamels 3) Varnishes 4) Lacquer – vinyl lacquers 5) Shellac 6) Primers – zinc and lead chromate primers 7) Rubber base coatings –chlorinated rubber, neoprene, and hypalon 8) Fluorocarbons-Teflon 9) Bituminous paints-coal tar paint	2
c) Describe with neat sketch buffing process.	4
Answer: *Sketch -2 mark& Explanation -2 mark* **Buffing process:** Buffing is the operation to produce smooth, uniform surface with a high,brilliant luster. In this work piece is brought in contact with revolving cloth buffing wheel that usually has been charged with a very fine abrasive. Buffing compounds can either be greaseless or have a grease base. Buffing wheels are made of felts pressed and glued layers or other cloth, and also of leather. The abrasives are mixed with a binder and are applied on the buffing wheel or on the work. The abrasives may be oxide, chromium oxide etc.  Buffing.	2 2

d)Explain abrasive blast cleaning process	4
Answer: Explanation -4 marks **Abrasive blast cleaning:** This method is widely used for removing all classes of scale and rust from forging, casting, weldments and heat treated parts. Depending on the finish requirements, blasting may be the only means of scale removals or it may be used to remove the major portion of scale with pickling employed to remove the remainder. In this process the parts are generally cleaned by the use of abrasive particles such as sand,steel-grit or shot thrown against the surface to be cleaned. Some cleaning is performed by means of a high velocity air blast directed by hand. In some cleaning abrasives are fed from an overhead storage hopper to the center of a radially rotating wheel. Some blasting are performed by airless blast machine for cleaning engine blocks, crankshafts, castings, railroad cars, car wheels, oil and gas pipes, steel strips etc.	4
e) Give any four advantages and disadvantages of CNC machines.	
Answer: *Advantages and disadvantages – 2 mark each* **Advantages of C.N.C. machines:** *(Any Four-1/2 mark each)* 1. Reduced lead time. 2. Elimination of operator's errors. 3. Lower labour cost. 4. Flexibility in changes of component design. 5. Reduced inspection. 6. Longer tool life 7. Elimination of special jigs and fixtures 8. Less scrap 9. Accurate costing & scheduling **Disadvantages of C.N.C. machines:** *(Any Four-1/2 mark each)* 1. Higher investment cost 2. Higher maintenance cost. 3. Higher personnel costs. 4. Planned support facility is required 5. Skilled manpower required for programming	2 2

f) Describe co- ordinate system used in CNC machines.	4

Answer: *Two Methods – 2 mark each*

Absolute Programming Method *(1 mark explanation, 1 mark sketch)*



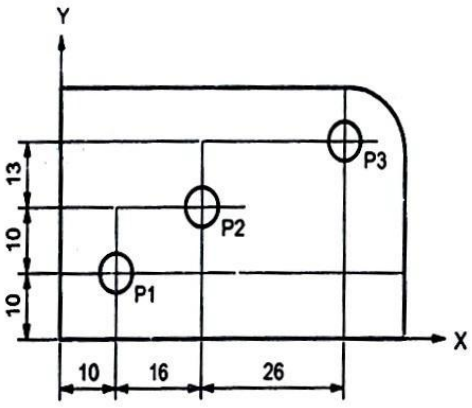
Point	X Coordinate	Y Coordinate
P1	10	10
P2	26	20
P3	52	33

1

It is a system in which coordinates of the points are referred to one reference point, which is the origin / set point. All the position coordinates are given from origin point. The main advantage of this system is that error in calculating the coordinates of one point is not introduced in coordinates of other point. Checking of the program in this system is easy. The G-code used for incremental programming is G-90.

1

2) Incremental Programming Method: *(1 mark explanation, 1 mark sketch)*



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

1

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

1

5. Attempt any FOURof the following:	**16**
a) Enlist and explain the basic components of CNC machines..	4
Answer: Enlist Component – 1 Mark & Explanation of any three components - 3 Marks 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. 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. 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.	
b) Give classification of CNC machines.	4
Answer: Any Four–1 Mark Each **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:** • Point – to – point system • Straight cut system **2. Continuous path system:** • Two axes contouring • Two & half axes contouring • Three axes contouring • 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	4

c) Give comparisons between conventional machines and CNC machines. 4

Answer: Any Four -1 mark each 4

Sr. No	Conventional Machines	CNC machines
1)	Basically conventional m/c have maximum 2 axis, known as X & Y axis.	CNC m/c have minimum 3 axis**,** known as X,Y,Z axis.
2)	Lead screw is responsible for axis movement in conventional m/c	Ballscrew is responsible for axis movement in CNC m/c
3)	All operations are performed manually. (except some auto mode).	All operations are performed hydraulically or pneumatically.
4)	There is no use of Servo motors & stepping motors for slide movement	Use of Servo motors & stepping motors for slide movement
5)	No Display units are provided in conventional m/c	Display units are provided in CNC m/c
6)	conventional m/c have Less accuracy	CNC m/c have More accuracy
7)	conventional m/c More operator error	CNC m/c have Less operator error
8)	Less Guarding Arrangements For conventional m/c	More Guarding Arrangements For CNC m/c
9)	Small changes is **not** possible in conventional m/c	Small changes is possible in CNC m/c
10)	No facility for dry run.	facility for dry run.
11)	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** beobtained.
12)	It does **not allow** compensation for change in cutting tool dimension.	It does **allow** compensation for change in cutting tool dimension.

d) Explain block format used in part programming. 4

Answer: Block Format -1 mark & explanation – 3 mark. (Credit should be given to any block format) 1

N_ G_X_ Y_ Z_ R_ F S_ T_M_ EOB

3

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

e.g. N05

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

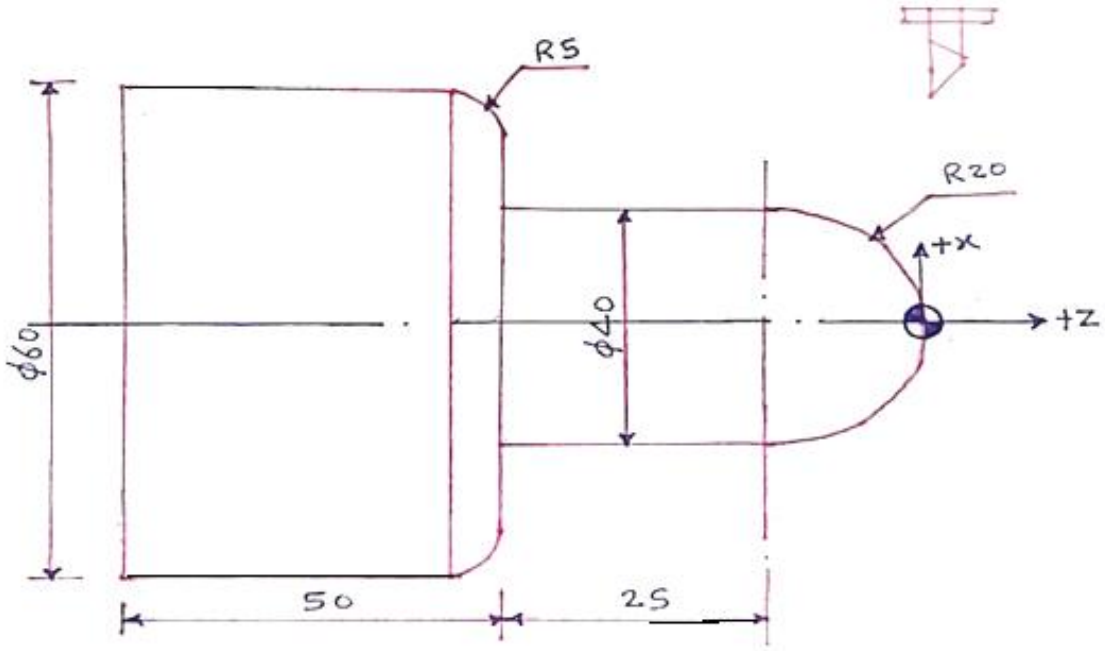
EOB: This sign is used to represent end of block

e) Write any four ISO codes used for preparatory functions. 4

Answer: Any Four- 1 Mark each (Code ½ mark & Function – ½ mark) 4

ISO Codes used for Preparatory Functions:

G Codes	Functions
G00	Rapid Point To Point Positioning Rapid Travel
G01	Linear Interpolation- Straight Linear Axis
G02	Clockwise Circular Interpolation
G03	Counter-Clockwise Circular Interpolation
G04	A Dwell, Stoppage of Axis Motion, Delay in Seconds
G22	CALL For Subroutine, Stored Stroke Limit ON
G25	Do Loop
G27	Zero Reference Point Return Check
G28	Home Position Of Tool
G70	Inch Mode Programming
G71	Metric Mode Programming
G74	Stock Removal In Facing On Turing Centers D = Depth Of Cut
G79	Canned Cycle ON
G80	Canned Cycle OFF
G90	Absolute Programming
G91	Incremental Programming
G94	Feed Rate Programming In "mm/min"
G95	Feed Rate Programming In "mm/rev"
G98	Subroutine Label, Return To Initial Level
G99	Return To Reference Level

f) Describe electrolytic surface cleaning process.	4
Answer: description – 4 mark &Credit should be given to sketch **Electrolytic Cleaning:** This is effective as final cleaning process for removing oil and grease from machinedsurface when extreme cleanliness is required. It is almost always used for final cleaning of steel parts prior to electro-plating. 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. 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. Chlorides should be carefully avoided and the soap content should be low or excessive foaming with danger of explosion may result.	4
6 Attempt any TWO of the following	**16**
a) Write a part program for following components as shown in figure No. 1 Assume suitable data for programming.	8
Answer: 	

Points	**X**	**Z**	**R**
0	**31**	**1**	
1	**0**	**1**	
2	**0**	**0**	
3	**20**	**-20**	**20**
4	**20**	**-45**	
5	**25**	**-45**	
6	**30**	**-50**	**5**
7	**30**	**-95**	
8	**31**	**1**	

2

N	G	X	Z	R	M	F	S	T
N00	G90							
N01	G71							
N02	G93				M41		S1500	
N03	G95							
N04	G28	X0	Z0					
N05					M06			T0101
N06					M03		S1500	
N07	G00	X31	Z1		M08			
N08	G00	X00	Z1					
N09	G00	X00	Z0			F0.1		
N10	G03	X20	Z – 20	20			S1500	D1
N11	G01	X20	Z – 45					
N12	G01	X25	Z – 45					
N13	G03	X30	Z – 50	5				
N14	G01	X30	Z – 95					
N15	G00	X31	Z1					
N16	G00	X0	Z1					
N17	G28	X0	Z0					
N18					M05			
N19					M09			
N20					M02			
N21					M30			

1

4

1

b) Write a part program for the job shown in figure No 2. 8

Answer:

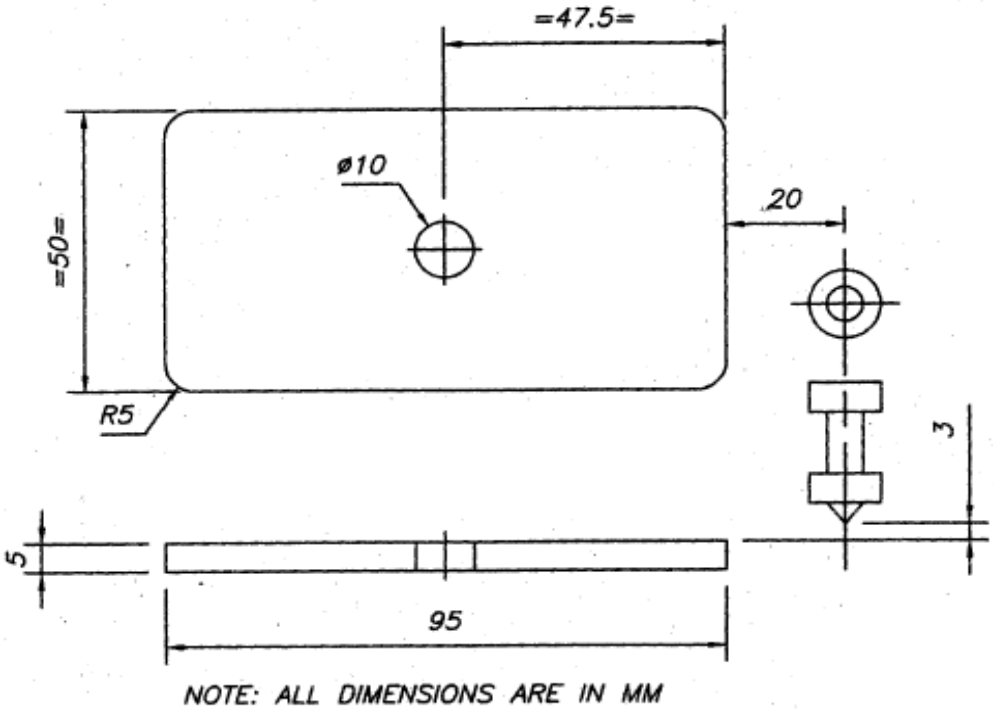


Fig. No. 2

Points	X	Y	Z	R
0	0	0	3	
1	5	0	3	
2	5	0	-5	
3	90	0	-5	
4	95	5	-5	5
5	95	45	-5	
6	90	50	-5	5
7	05	50	-5	
8	0	45	-5	5
9	0	5	-5	
10	5	0	-5	5
11	0	0	3	
12	47.5	25	3	
13	47.5	25	-5	
14	47.5	25	3	
15	105	20	3	

2

N	G	X	Y	Z	R	M	F	S	T
N00	G17								
N01	G71								
N02	G28								
N03	G90								
N04	G95								
N05		X0	Y0						
N06	G92								
N07						M06			T01
N08	G00	X0	Y0	Z3		M03			
N09	G00	X5	Y0	Z3		M08			
N10	G01	X5	Y0	Z-5			F0.1	S800	
N11	G01	X90	Y0	Z-5					
N12	G03	X95	Y5	Z-5	R5				
N13	G01	X95	Y45	Z-5					
N14	G03	X90	Y50	Z-5	R5				
N15	G01	X5	Y50	Z-5					
N16	G03	X0	Y45	Z-5	R5				
N17	G01	X0	Y5	Z-5					
N18	G03	X5	Y0	Z-5	R5				
N19	G00	X0	Y0	Z3					
N20						M06			T02
N21	G00	X47.5	Y25	Z3					
N22	G01	X47.5	Y25	Z-5					
N23	G00	X47.5	Y25	Z3					
N24	G00	X105	Y25	Z3					
N25						M05			
N26						M09			
N27						M02			
N28						M30			

1

4

1

c) Give classification of press operations and describe drawing and squeezing operations in details. 8

Answer: *Classification – 2 marks, Drawing operation- 3 marks & Squeezing – 3 marks*

Classification of Press Operations: *(Any Four – ½ Mark each)*

1. **Cutting or shearing operations:**
   Blanking, Punching, Piercing, Notching, perforating, trimming, shaving, slitting, lancing.
2. **Bending Operation:**
   Angle bending
3. **Forming Operation**
   Flanging, curling, wiring, tube forming, stretch forming, embossing
4. **Drawing operations:**
   Cupping, redrawing, reverse redrawing, deep drawing, panel drawing, bulging.

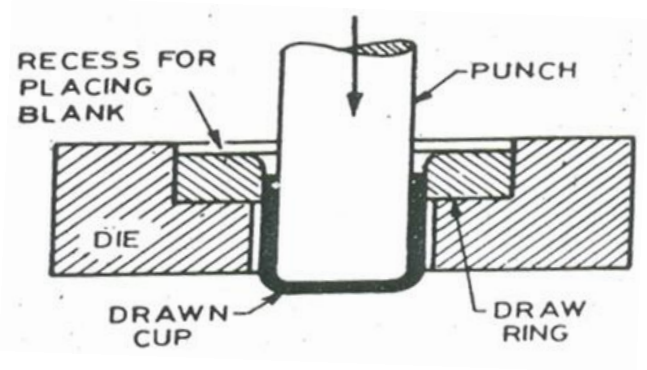
2

5. **Reducing operations:**
   Ironing, necking, redrawing
6. **Squeezing operation:**
   Coining, sizing, swaging, hot pressing.

Drawing Operation: *(Sketch -1 mark & Description – 2 mark)*

- The drawing is the operation of production of cup shaped parts from flat sheet metal blanks by bending and plastic flow of the metal.
- The blank is placed on die and while punch descend, the pressure pad holds the blank firmly on the die
- 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
- In this, clearance between punch and die is greater.
- The drawing operation is illustrated in Figure.

2



1

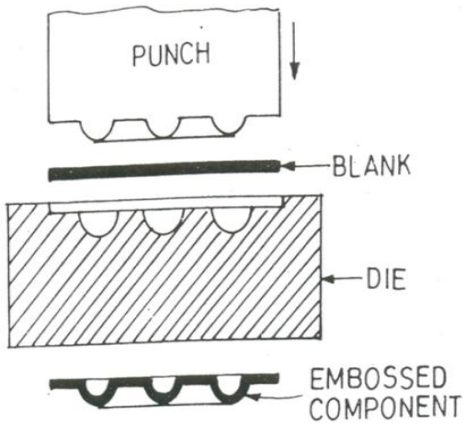
Squeezing operation: (Sketch -1 mark & Description – 2 mark)

There two types of squeezing operations are described below:

1. **Embossing Operation:**

   - 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 , trade marks
   - Punch operates relatively at low speed to allow metal to stretch

2



1

OR

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