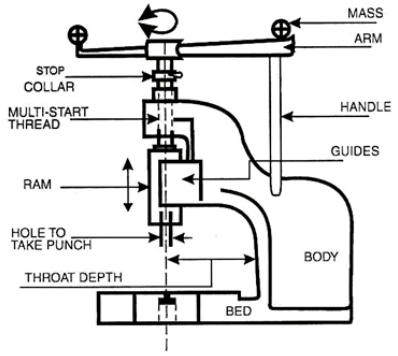
WINTER – 19 EXAMINATIONS

Subject Name: MFP **Model Answer** Subject Code: 17402

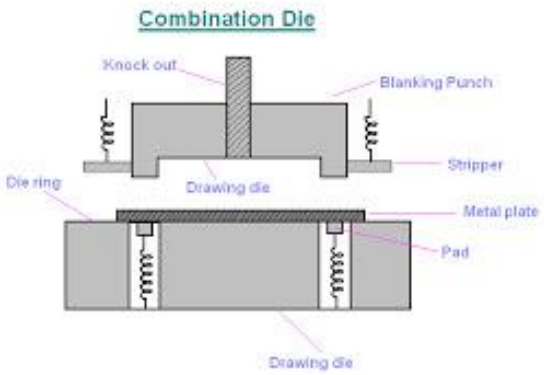
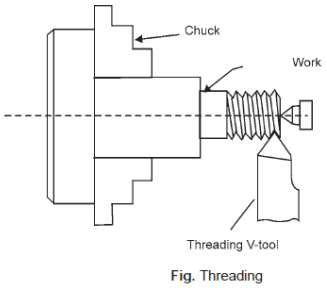
Important Instructions to examiners:

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.N	Bit	Answer	Marking Scheme
1		**Attempt any FIVE of the following**	
	a	**Classify presses. Describe one in brief.** A) According to source of power: a) Mechanical press b) Hydraulic press B) According to number of slides: a) Single action press b) Double action press c) Triple action press C) According to type of frame: a) Open frame press b) Closed frame press D) According to operation : a) Punching	½ each any two types, 1 mark for sketch, 2 marks for description

		b) Blanking c) Drawing d) Bending **Mechanical (Manually operated/ Fly) Press:** The press is operated by human hands. It is a bench mounted press commonly used for the production of small components. It is a simple and low cost press, suitable for light operations, like piercing, blanking, bending, etc. As the Fig. shows, the arm is rotated manually, the ram moves, up and down to perform the necessary operation. The ram is fitted with punch and the job is resting on the bed.  **Fig.** A manually operated (Fly) Press.	
	b	**Forging-** Forging is defined as controlled plastic deformation of metals at elevated temperatures into a pre-determined size or shape using compressive forces exerted through some type of die by a hammer or press. **Types of forging method:** 1. Drop forging, 2. Press forging, 3. Hot bar forging, 4. Upset forging, 5. Swing forging 6. Cored forging, 7. Rotary forging.	02 marks for definition, ½ for each type any four)
	c	**Advantages/Merits of Cold Working** 1. Cold working increases the strength and hardness of the material due to the strain hardening which would be beneficial in some situations. there is no possibility of decarburization of the surface. 2 Since the working is done in cold state, hence no oxide formation on the surface and consequently, good surface finish is obtained. 3. Greater dimensional accuracy is achieved. 4. Easier to handle cold parts and also economical for small sizes. 5. Better mechanical properties are achieved. **Disadvantages/Demerits of Cold Working** 1. Only small sized components can be easily worked as greater forces are required for large sections. Due to large deforming forces, heavy and expensive	½ marks for each merit, ½ marks for each demerits (any four)

		capital equipment is required. 2. The grain structure is not refined and residual stresses have harmful effects on certain properties of metals. 3. Many of the metals have less ductility e.g., carbon steel and certain alloy steels, cannot be cold worked at room temperature. It is therefore, limited to ductile metals and the range of shapes produced is not as wide as can be obtained by machining. 4. Tooling costs are high and as such it is used when large quantities of similar components are required.	
	d	**Properties of plastics:-** 1. Light in weight. 2. Easy workability. Easy to shape and mould. 3. Highly resistant to corrosion. 4. Highly resistant to abrasion., moistuer and greases. 5. Good thermal and electrical insulators. 6. Good strength and rigidity. 7. Absorbent of vibrations and sound. 8. Good resistant to most of the chemicals. 9. Impermeable to water. 10. Low fabrication cost. 11. Good dimensional stability. 12. Can be made transparent or coloured.	1 mark each any four points
	e	**Cutting Speed: -** It is the speed at which the metal is removed by the tool from the work piece. In lathe it is the peripheral speed of the work past the cutting tool expressed in meter per minute. Cutting speed is directly proportional to the surface or peripheral sped of the work. It considerably effects on the tool life and efficiency of machining. It affects on machining time there by productivity and the production cost **Feed: -** It is the distance the tool advances for each revolution of the work. Feed is expressed in mm/ rev. It is influenced by the material being machined, geometry of the cutting tool, required degree of surface finish, rigidity of the machine tool being used, and type of coolant being used.	02 marks for each explanation
	f	**Combination Dies:** In this die more than one operation may be performed at one station. It is difficult from compound die in that in this die, a cutting operation is combined with a bending or drawing operation, due to that it is called combination die. The die may be defined as the female part of a complete tool for producing work in a press. It is also referred to a complete tool consists of a pair of mating members for producing work in a press.	02 marks for sketch, 02 marks for explanation

			
	g	**Properties of moulding sand are:** i) Cohesiveness or (strength) of sand, ii) Permeability (Porosity) iii) Plasticity iv) Thermal Stability v) Refractoriness vi) Flow ability, vii) Adhesiveness, viii)Collapsibility ix) It should be reusable and should produce good casting surface. x) It should be bad conductor of heat.	1 mark each any four
2		**Attempt any FOUR of the following**	
	a	**Thread cutting operation:-** The principle of thread cutting is to produce a helical groove on cylindrical/conical surfaces by feeding the tool longitudinally when the job is revolved between centers. In this operation, as shown in Fig. the work is held in a chuck or between centers and the threading tool is fed longitudinally to the revolving work. The longitudinal feed is equal to the pitch of the thread to be cut.  Fig. Threading **Fig. Thread cutting operation**	2 marks for sketch, 2 marks for explanation
	b	**Radial drilling machine:** A radial drilling machine is illustrated in Fig. This is really meant to drill holes in bigger and heavier work pieces, which cannot be manipulated so that the centre of the hole may be aligned with the drilling spindle. In this case, the drilling head is mounted on a radial arm. The radial arm can be rotated around the round column and the drilling head can be moved in or out on the radial arm. The work piece is kept on the table which is really an integral part of the base and by the combined movement of the radial arm and the drilling head (think of the polar coordinates θ, r), any point on the work piece can be covered and a hole drilled at the required location, without shifting the heavy work piece.	02 marks for sketch, 02 marks for explanation

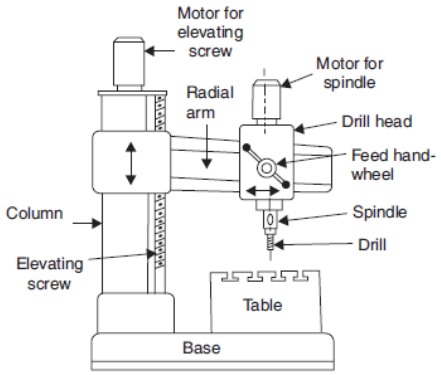
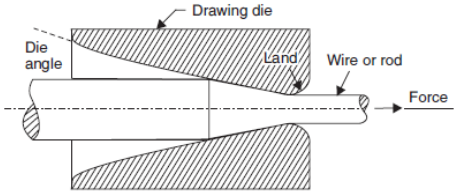


Fig. Radial drilling machine

	c			02 mark each any two points

Welding defects	causes	Remedies
Cracks	Cracks occur when localized stresses exceed the ultimate tensile strength of material. These stresses are developed due to shrinkage during solidification of weld metal. Cracks may be developed due to poor ductility of base metal, high sulpher and carbon contents, high arc travel speeds i.e. fast cooling rates, too concave or convex weld bead and high hydrogen contents in the weld metal.	Modify the joint design to minimize stresses developed from shrinkage during cooling. Change the parameters, procedures, and sequence of the welding operation. Preheat the components to be welded. Avoid rapid cooling of the welded components.
Porosity	Porosity results when the gases are entrapped in the solidifying weld metal. These gases are generated from the flux or coating constituents of the electrode or shielding gases used during welding or from absorbed moisture in the coating. Rust, dust, oil and grease present on the surface of work pieces or on electrodes are also source of gases during welding.	Proper selection of electrodes and filler metals. Improved welding techniques, such as preheating the weld area or increasing the rate of heat input. Proper cleaning and the prevention of contaminants from entering the weld zone. Reduced welding speeds to allow time for gas to escape.
Lack of Fusion	Too fast a travel, Incorrect welding technique, Insufficient heat	Raising the temperature of the base metal. Cleaning the weld area before welding. Modifying the joint design and changing the type of electrode used. Providing sufficient shielding gas.
Slag Inclusion	Slag from previous runs not being cleaned away, Insufficient cleaning and preparation of the base metal before welding commences.	Cleaning the weld-bead surface by means of a wire brush (hand or power) or a chipper before the next layer is deposited. Providing sufficient shielding gas. Redesigning the joint to permit sufficient space for proper manipulation of the puddle of molten weld metal.

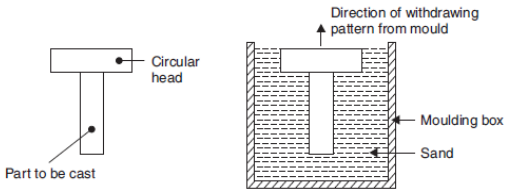
	d	**Wire Drawing:-** In this process, rods made of steel or non ferrous metals and alloys are pulled through conical dies having a hole in the centre. The included angle of the cone is kept between 8 to 24°. As the material is pulled through the cone, it undergoes plastic deformation and it gradually undergoes a reduction in its diameter. At the sametime, the length is increased proportionately. The process is illustrated in Fig.  **Fig.** Wire drawing process	02 marks for sketch, 02 marks for explanation
	e		1 mark each any four points

Open die forging	**Close die forging**
In Open-die forging metal is shaped by hammering or pressing between flat or simple contoured dies . In open die forging the dies do not completely cover the work piece.	In closed-Die Forging, the work piece is completely surrounded by the dies. Closed die forging (also referred to as impression die forging) is a metal deformation process that uses pressure to compress a piece of metal to fill an enclosed die impression.
Better fatigue resistance and improved microstructure Increases strength and longer part life	The internal grain structure formation increases the tightness and strength of the products.
Machining is often required to achieve desired dimensions	Less or no machining required for its close tolerances
Economical for short run (batch production)	economical for mass production due to the high cost of die production
Used for forging of long and simple parts	Used for forging of complex parts
Application : forged long shafts, forged rollers, and forged cylinders used for the application of railway and aircraft industry	forged fittings, forged lifting & rigging hardware, forged automotive parts used for Oilfield, automotive, forestry & agriculture, and mining industry

	f	**Types of pattern:** 1. Single piece pattern 2. Split pattern 3. Match plate pattern 4. Cope and drag pattern 5. Gated pattern 6. Loose piece pattern 7. Sweep pattern 8. Skeleton pattern 9. Segmental pattern 10. Shell pattern	½ mark for type (any four), 01 mark for sketch, 01 mark for explanation (any one)

11. Built up pattern
12. Boxed up pattern
13. Lagged up pattern
14. Left and right hand pattern

(i) **Solid or single piece pattern:** Such patterns are made in one piece and are suitable only for very simple castings. There is no provision for runners and risers etc. Moulding can be done either in the foundry floor (called pit moulding) or in a moulding box. There is no difficulty in withdrawing the pattern from the mould as the broadest portion of the pattern is at the top. As an example, if a cylindrical pin with a circular head has to be cast, a one piece pattern shown in Fig. will be adequate.



(ii) **Split pattern:** It is not practical to have one piece pattern for parts of complicated shapes, because it would not be possible to withdraw the pattern from the mould. For example, if a circular head was added to the bottom of the pin shown in Fig, it would make it necessary to go in for a split pattern as shown in Fig. One-half of the impression in the mould will be made by using piece no. 1 in one moulding box and the other half of the impression will be made by using piece no. 2 in a second moulding box. After withdrawing the pattern halves from the respective moulding boxes, the two boxes will be assembled and clamped together, so that the complete impression is available for pouring the metal. The two pattern halves are provided with locating dowels, so that one-half may sit on the other half in the exact position required with no mismatch. Also two tapped holes are provided on the flat mating surface of each part. These tapped holes are used to provide a grip to lift the pattern halves from the sand without damaging the mould-impression.

The line along which the pattern is divided into halves is called “parting line” and it usually follows the broadest cross-section of the casting. Deciding where the parting line should be is a matter of considerable skill and experience. Some of the more complicated castings may require pattern to be split in three or even more pieces.

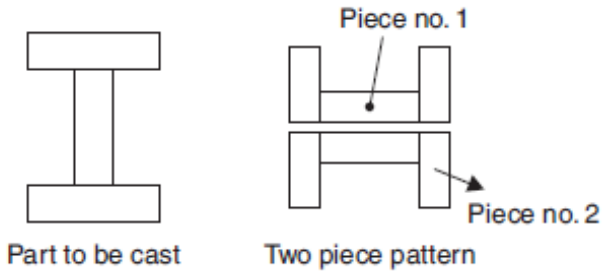
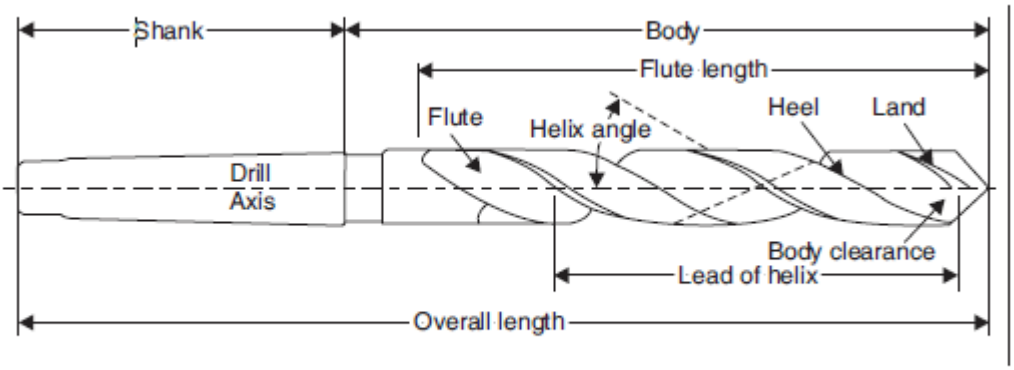


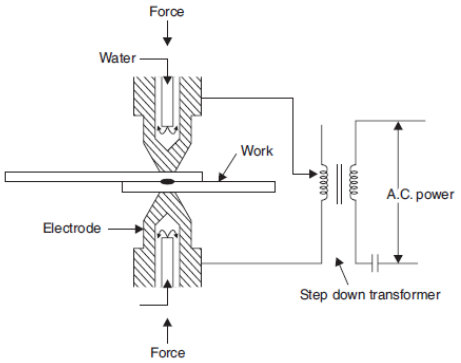
Fig. 2

3		**Attempt any FOUR of the following**	
	a	 **Fig** Nomenclature of a standard twist drill **Point:** The point is the cone shaped end and it does the cutting. It consists of the following: (A) Lips: these are the cutting edges of the drill. (C) Heel: It is the portion of the point back from the cutting edge. **Shank:** It is the portion of the drill by which it is clamped in the spindle. The shank may be either straight or tapered. This fits into a slot in the spindles sleeve. **Body:** It is the portion between the point and the shank. The body consists of the following parts: **(A) Flutes:** Two or more spiral grooves that run the length of the drill body are called flutes. The flutes do four things. · Help from the cutting edge of the drill point. · Curl the chip tightly for easier removal. **(B) Margin** It is the narrow strip extending back the entire length of the flute. It is the full diameter of the drill. **(C) Body Clearance:** It is the part of the drill body that has been reduced in order to cut down friction between the drill and the wall of the hole.	02 marks for sketch, ½ marks for description any four points

b

Electric resistance welding :-

In electric resistance welding (ERW) methods, a high current is passed through the metal pieces to be joined together and the heat is produced due to the resistance in the electric circuit. This heat energy is utilized to increase the temperature of a localized spot of the work pieces to produce coalescence, and then applying pressure at this spot till welding takes place. Electric resistance welding process is a pressure welding process and not a fusion welding process. The output of heat, in this process can be easily calculated. Heat generated is proportional to $I^2R \cdot t$, where I is value of current, R is resistance and t is the time during which current flows.



02 marks for sketch, 02 marks for explanation

c

Hot Rolling	Cold Rolling
It is carried out above the recristalisation temperature.	It is carried out below the recrystalisation temperature.
Improved Mechanical properties.	Process leads in to distortion of grains.
It requires less power for rolling.	It requires more power for rolling.
No internal or residual stresses are set up	Residual or internal stresses are setup in the metal.
No cracks and blow holes are present in the metal.	Existing cracks propagates and new cracks may developed.
Close dimensions cannot be maintained.	Superior dimensional accuracy can be Obtained.
It is used for plates, bars, structural sections, channels production.	It is used for rods, sheets, plates bar etc.

1 mark each any four points

	d	1. **Bolster Plate** :- It is the flat plate fitted on the base for supporting the die block and other accessories of the press. 2. **Frame:-** Frame constitute main body of the press located at one edge of its base. It houses support for ram, driving mechanism and control mechanisms. All presses except the straight side type have "C" shaped frame to take up the vertical thrust of the ram. 3. **Base**:- The base is the supporting member of the press and provides arrangement for tilting and clamping the frame in an inclined press. 4. **Driving mechanism**:- The rotary movement of the motor is converted into the reciprocating movement of the ram by crank and connecting rod,eccentric and connecting rod in mechanical presses. 5. **Pitman**:- It is the part which connects the ram and crankshaft or ram eccentric. 6. **Ram**:- Ram reciprocates to and fro within its guide ways with prescribed stroke length and power. The stroke length and power transferred can be adjusted as per the requirements. Ram at its bottom end carries punch to process the work piece. 7. **Brakes**:- The brakes are used to stop the movement of the driving shaft immediately after it is disconnected from the fly wheel 8. **Clutch** :- The clutch is used for connecting and disconnecting and the driving shaft with the flywheel when it is necessary to start or stop the movement of the ram. 9. **Fly Wheel**:- The flywheel is mounted at the edge of the driving shaft and is connected to it through a clutch. The energy is stored up in the fly wheel during idle periods and it is expected to maintain the constant speed of the ram when the punch is pressed into the work .	03 marks for list 1/2 marks for each (any 6 parts), 01 mark for explanation (any one)
	e	1. **Blow holes:** It is smooth sound cavities produced in a casting due to entrapped bubbles of gases, steam. **Causes:-** i) Excessive moisture in the sand. ii) low permeability of sand iii) Sand grains are too fine iv) Sand is rammed too hard v) Venting is insufficient **Remedies:-** i) Moisture content of the sand must be well. ii) Sand of proper grain size should be used. iii) Ramming should not be too hard. iv) Vent holes should be provided. **2. Mis-run and cold shut:-** When molten metal fails to fill the entire cavity of the mould, incomplete casting is obtained. This defeat is called mis-run and imperfect fusion of two stream of molten metal in the mould cavity results in a discontinuity called cold-shut. **Causes:-** i) Too thin sections and wall thickness. ii) Improper gating systems. iii) Damaged pattern. iv) Slow and intermediate pouring. v) Pour fluidity of metal. vi) Improper ally composition. **Remedies:-** i) Use hotter metals ii) Frequent inspection and replacement of pattern. iii) Proper design of gating and raiser	1 mark for each defect (any two) ½ mark each cause and remedy (any two)

iv) Use of chills and padding.

3. **Drop: -** This is an irregular deformation of the casting produced when a portion of the sand drops into the molten metal.

Causes:-

i) It is caused due to low strength

ii) soft ramming

iii) Insufficient reinforcement of hanging section

Remedies:

i) These can be controlled by adopting proper moulding, gating and melting techniques.

4. **Dirt: -** Presence of particles of dirt and sand in the casting.

Causes:-

i) improper handling of mould

ii) Presence of sand slag particles in molten metal

Remedies:-

i) Proper handling of mould

ii) Adopting proper moulding, gating and melting techniques.

iii) Proper design of gating and raiser

iv) Use of chills and padding

5. **Shifts: -** It is a misalignment of top and bottom parts of mould at parting line. This results in mismatch of the casting, incorrect dimension, incorrect location of holes.

Causes:-

i) misalignment of pattern parts, due to worn or damaged patterns

ii) misalignment of moulding box or flask equipment

Remedies:-

i) ensuring proper alignment of the pattern, moulding boxes
ii) correct mounting of pattern on pattern plates etc

6. **Fins and flash: -** It is a thin metal projection on casting.

Causes:-

i) incorrect assembly of moulds and cores

ii) Improper clamping of the mould

iii) excessive rapping of the pattern

iv) insufficient weight on the top part of the mould

Remedies:-

i)These can be controlled by adopting proper moulding, gating and melting

techniques.
ii) insufficient weight should be placed on the top part of the mould

7. Swell: - It is un-intentional enlargement found on the casting surface due to liquid metal pressure.

Causes:-

i) improper ramming

ii) low strength of mould

iii) Pouring the metal too rapidly

Remedies:-
i) Proper ramming of sand
ii) uniform flow of molten metal into the mould

8. **Run-out: -** This defect occurs when molten metal leaks out to the mould during pouring. It results in incomplete casting.

Causes:-

i) defective moulding boxes

ii) inadequate mould weights

iii) excessive pouring pressure

Remedies:-
i) The corrective measures taken in respect of the above reasons will prevent this defect.

9. **Warpage: -** This is unintentional and undesirable deformation of casting produced during solidification of metal.

Causes:-

i) inadequate and improper gating, runners and risers

ii) continuous large flat surface on casting, indicate a poor design

Remedies:-
i) This defect can be eliminated by modifying the casting design and proper directional solidification.

10. **Hot tears (Hot Cracks):-** These are internal or external cracks resulting immediately after the solidification of metal.

Causes:-

i) abrupt changes in section

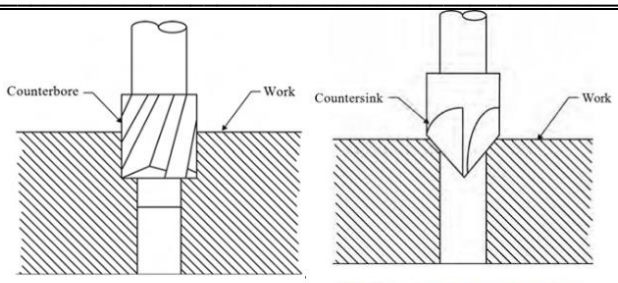
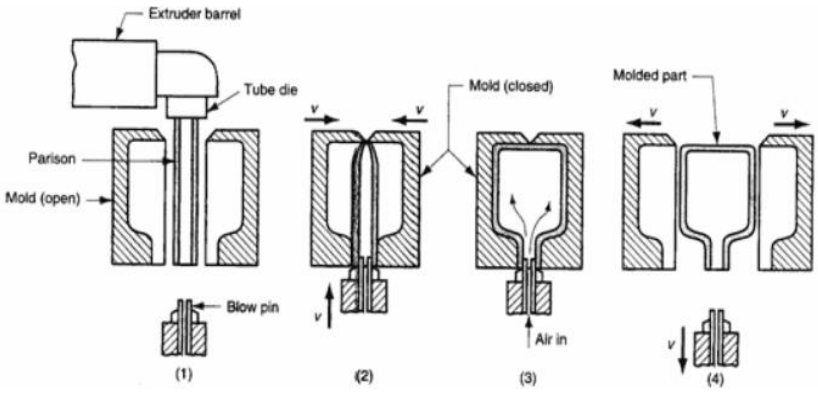
ii) poor design

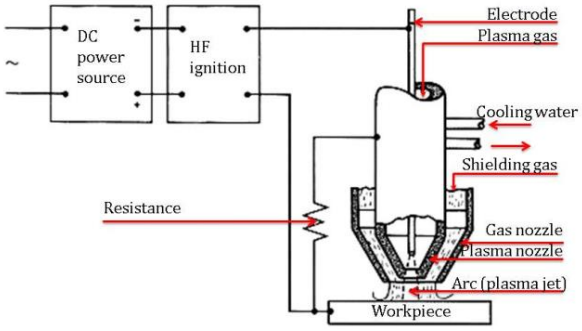
iii) incorrect pouring temperature

Remedies:-
i) abrupt change in section should be avoided
ii) Pouring temperature should be correct
iii) there should be even rate of cooling

11. Core shift

		12. Sand wash **13. Shrinkage** **14. Core blow** **15. Scabs** **16. Pour short** **17. Metal penetration** **18. Rough surface finish** **19. Crush**	
	f	**Factors Governing Selection of proper material for pattern making** 1) Dimensional accuracy. 2) Metal to be cast. 3) No. of castings to be produced. 4) Position of core print. 5) Nature of molding process. 6) Type of molding materials. 7) Casting design parameters. 8) Shape, complexity and size of casting. 9) Surface finish.	01 mark for each point any four
4		**Attempt any FOUR of the following:**	
	a	**Counter boring & Counter sinking Operation:** **Counter boring: -** Counter boring is the operation of enlarging the end of a hole with a hole cylindrically. Counter bores provide a shoulder to accommodate the heads of bolts, studs, and pins. The tool used for counter boring is called a counter bore. The cutting edges may have straight or spiral teeth. The cutting speed for countersinking is 25% less than that of drilling operation. **Countersinking:-**Countersinking is the operation of producing a taper or cone shape surface at the entrance of a hole for the purpose of having the head of a flat head screw, aviation rivet or other similar fastener sit flush or below a surface. This cone shape is machined with tool called countersink. Countersinks are available as a single flute or multi flute. A variety of sizes and included angles of: 60°, 82°, 90°, 100°, 110°, and 120° are available. The cutting speed for countersinking is 25% less than that of drilling operation.	02 marks each (1 mark for explanation, 1 mark for sketch)

		 Fig Counterboring Operation Fig Countersinking Operation	
	b	**Blow moulding Process:** In this process, a hot extruded tube of plastic, called a parison, is placed between two part open moulds. The two halves of the mould move towards each other so that mould closes over the tube. The tube gets pinch off and welded the bottom by the closing moulds. The tube is then expanded by internal pressure, usually by hot air, which forces the tube against the walls of the mould. The component is cooled and the mould opens to release the component. 	02 marks for explanation, 02 marks for sketch
	c	**Plasma Arc Welding :** It is generated with the temperature which is developed from a special setup between a tungsten alloy electrode and the water-cooled nozzle (Non-transferred ARC) or between a tungsten alloy electrode and the job (transferred ARC). In this type of winding, there are three types of gas supplies being utilized namely plasma gas, shielding gas, and a back-purge gas. Plasma gas supplies throughout the nozzle turn into ionized. The shielding gas supplies throughout the external nozzle & protects the join from the environment. Back-Purge gas is mainly used when particular materials are being used.	02 marks for explanation, 02 marks for sketch



d

Forward or direct extrusion	Backward or indirect extrusion
Simple, but the material must slide along the chamber wall.	In this case, material does not move but die moves.
High friction forces must be overcome.	Low friction forces are generated as the mass of material does not move.
High extrusion forces required but mechanically simple and uncomplicated.	25–30% less extruding force required as compared to direct extrusion. But hollow ram required limited application.
High scrap or material waste—18–20% on an average.	Low scrap or material waste only 5–6% of billet weight.

Any 4 points 04 Marks

e

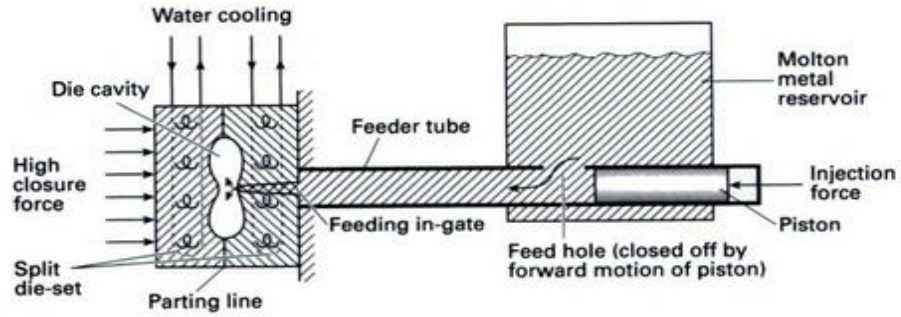
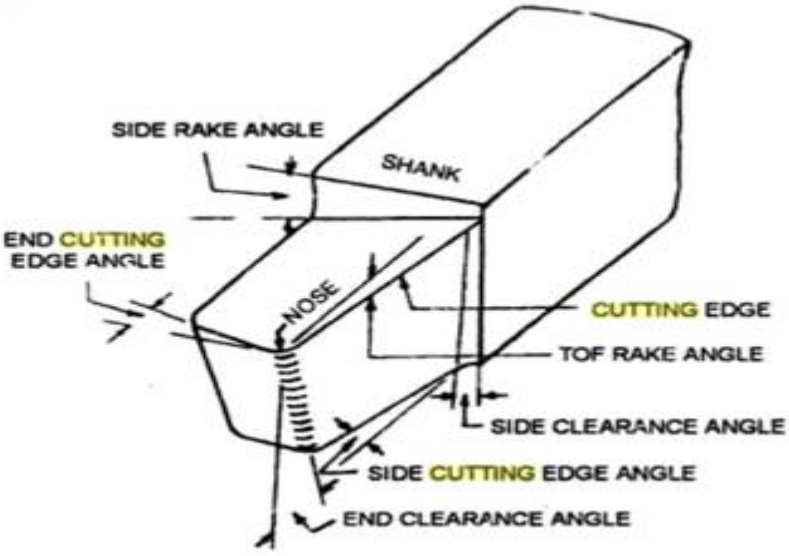
Sand Preparation and Sand Conditioning:

Proper conditioning and preparation of sand is needed to get good quality castings. Sand preparation is also known as sand tempering and the quality of moulding sand depends upon the manner in which it is prepared. Sand preparation means mixing the moulding sand ingredients, such as sand, binder, clay, water and other additions. Sand conditioning means preparation of moulding sand, so that it becomes suitable for moulding purposes.

STEPS INVOLVED IN SAND PREPARATION

1. Remove, from sand grains, all foreign particles such as fins, nails, etc. by passing it through a sieve or by magnetic separators.
2. Mix the sand ingredients in sand mixing machines.
3. Continue mixing or mulling till there is uniform distribution of ingredients. Muller, as shown in Fig. 2.18, is the most commonly used mixing unit for mixing sand.
4. In the next step, treat the sand by the areation process. Areation makes a sand buffy, and easy to handle. Aerated sand produces better moulding results.

02 marks for each process

	f	**Hot Chamber Casting:** Hot chamber die casting – not suitable for aluminium and its alloys High-pressure die casting relies upon the action of a piston to deliver molten metal into the die cavity from a storage reservoir (the hot chamber from which this process derives its name). This piston has a four-stage operating cycle: 1. closing off the metal feed from the hot chamber reservoir 2. moving the liquid metal charge up a feeder tube to the die's feeding-in gate 3. injecting the molten metal into the die cavity as quickly as possible 4. intensifying the injection pressure on the injected metal to compact it and eliminate any risk of porosity forming in the casting during solidification  Hot chamber die casting principle.	02 marks explanation & 2 marks sketch
5		**Attempt any FOUR of the following:**	
	a	**Single point cutting tool nomenclature:**  	02 marks for sketch and 02 marks for any 02 points

1. Top rake angle

It is also called back rake angle. It is the slope given to the face or surface of the tool. This slope is given from the nose along the length of the tool.

2. Side rake angle

It is the slope given to the face or top of the tool. This slope is given from the nose along the width of the tool (side ways). The rake angles help easy flow of chip.

3. Clearance angle or relief angle

These are the slopes ground downwards from the cutting edges. Those are two clearance angles namely, side clearance angle and end clearance angle. This is given to the tool to prevent rubbing of the job on the tool.

4. Cutting edge angles

There are two cutting edge angles namely side cutting edge angle and end cutting edge angle.

Side cutting edge angle is the angle, the side cutting edge makes with the axis of the tool.

End cutting edge angle is the angle, the end cutting edge makes with the width of the tool.

5. Lip angle

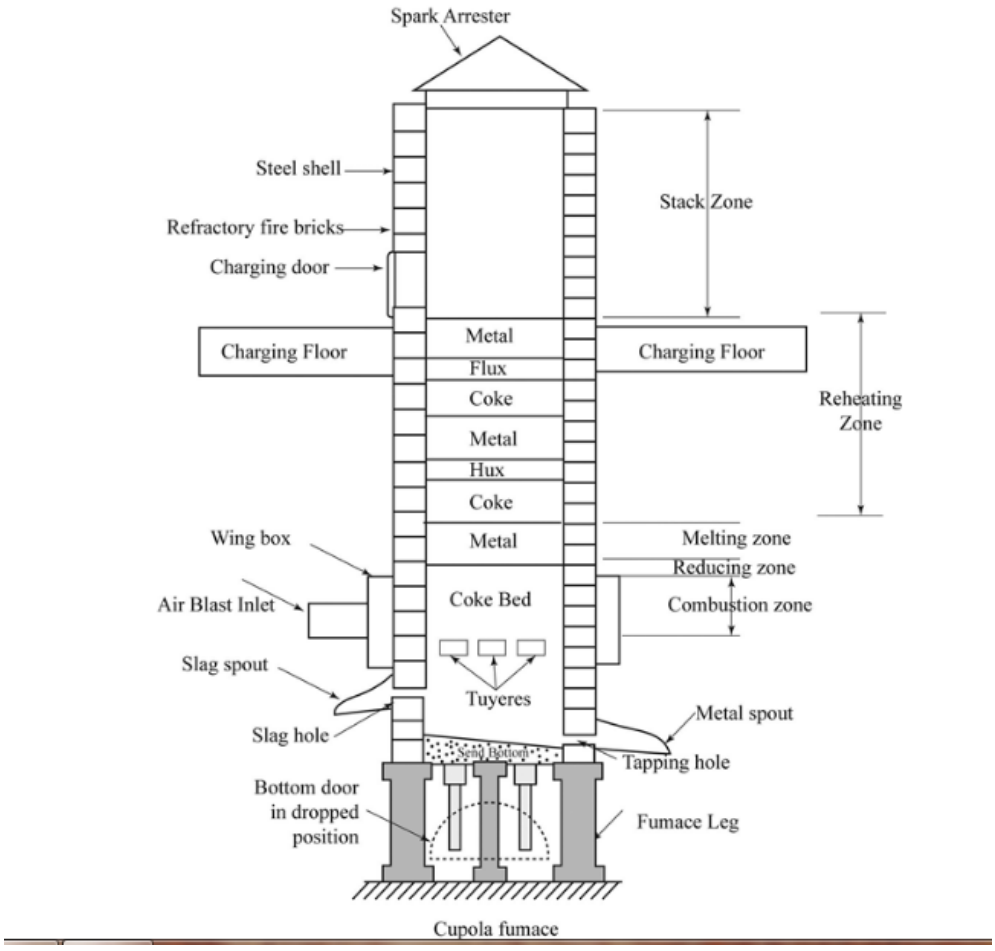
It is also called cutting angle.

It is the angle between the face and end surface of the tool.

6. Nose angle.

It is the angle between the side cutting edge and end cutting edge.

b **Cupola furnace:**

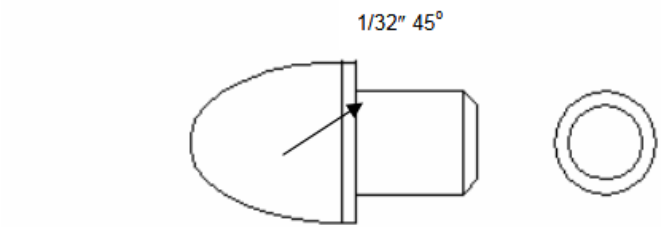


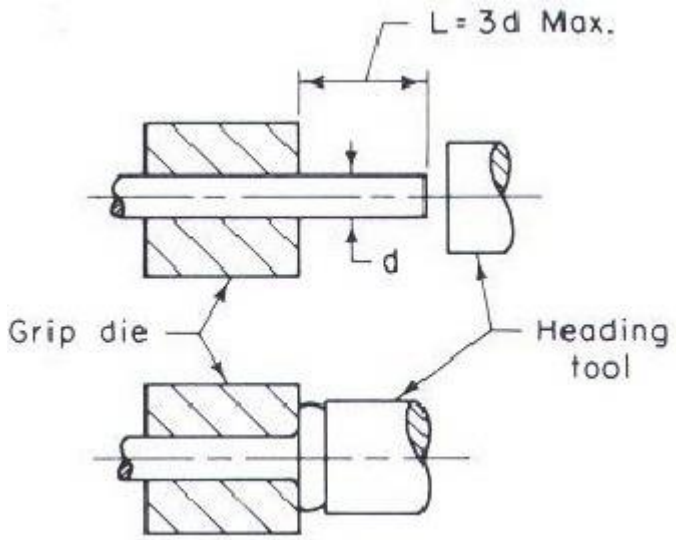
03 marks for sketch, 01 mark for labeling

c

Brazing	Soldering
1) Strength of joint is more	1) Strength of joint is Less
2) Filler metals Copper or Silver	2) Filler metals Tin and lead alloy
3) Temperature of filler metal is above 420 ^{o}C	3) Temperature of filler metal is below 420o c
4) Cost is more	4) Cost is less
5) Used in refrigeration systems	5) Used in electrical and electronics systems

Four marks for 4 differences(any)

	d	**Color Coding system in pattern making:** The following colour coding is generally used in Pattern making RED:- Surfaces to be machined BLACK:- Surfaces to be left unmachined. Yellow:- Core Prints Red strips on yellow base:- Seats for loose pieces Black strips on yellow base:- Stop offs Clear or No colour:- Parting surface	01 mark each any four points
	e	**Name of Die accessories:** 1. Punch Holder. 2. Punch. 3. Die holder. 4. Bottom stop . 5.Lever Stop. 6.Pilots. 7.Strippers. 8.Knockouts. 9.Pressure Pad. 10.Punch Plate. 11.Backing plate. 12. Dowels pin. **Pilots** The main purpose of a pilot is to position the stock strip accurately. Pilots also bring the stock strip into proper position for blanking and piercing operation simultaneously. If strip is fed by hand, it may go beyond proper position due to strip stop. In such a situation, pilot takes it back to proper position in a direction away from the strip stop. Pilot also prevents buckling of strip. When the strip is fed by hand, under feeding of strip occurs and pilot pulls the strip forward. Diameter of pilot is generally 0.002 to 0.003 inch smaller than punch diameter for average work and 0.0005 to 0.001 inch smaller than punch diameter for precision work.  **Figure 5.9 : Pilot** Length of pilot is at least 1/4 inch longer than punches. In this way, pilot will take care of proper positioning before actual cutting. Pilot nose contour is shown in Figure 5.9.	½ Mark each for any 4 points 2 Marks for Description (any one)

	f	**Upset forging :-** Upset forging increases the diameter of the work piece by compressing its length. Based on number of pieces produced, this is the most widely used forging process. A few examples of common parts produced using the upset forging process are engine valves, couplings, bolts, screws, and other fasteners. Upset forging is usually done in special high-speed machines called crank presses. The machines are usually set up to work in the horizontal plane, to facilitate the quick exchange of work pieces from one station to the next, but upsetting can also be done in a vertical crank press or a hydraulic press. The initial work piece is usually wire or rod, but some machines can accept bars up to 25 cm (9.8 in) in diameter and a capacity of over 1000 tons. The standard upsetting machine employs split dies that contain multiple cavities. The dies open enough to allow the work piece to move from one cavity to the next; the dies then close and the heading tool, or ram, then moves longitudinally against the bar, upsetting it into the cavity. If all of the cavities are utilized on every cycle, then a finished part will be produced with every cycle, which makes this process advantageous for mass production.  Fig: Upset Forging	02 marks for sketch, 02 marks for explanation
6		**Attempt any FOUR of the following:**	
	a	**Important Parts of Lathe and their Functions** **1. Bed** It is the main body of the machine. All main components are bolted on it. It is usually made by cast iron due to its high compressive strength and high lubrication quality. It is made by casting process and bolted on floor space.	01 mark each any four parts

		2. Tool post It is bolted on the carriage. It is used to hold the tool at correct position. Tool holder mounted on it. **3. Chuck** Chuck is used to hold the workspace. It is bolted on the spindle which rotates the chuck and work piece. It is four jaw and three jaw according to the requirement of machine. **4. Head stock** Head stock is the main body parts which are placed at left side of bed. It is serving as holding device for the gear chain, spindle, driving pulley etc. It is also made by cast iron. **5. Tail stock** Tail stock situated on bed. It is placed at right hand side of the bed. The main function of tail stock to support the job when required. It is also used to perform drilling operation. **6. Lead screw** Lead screw is situated at the bottom side of bed which is used to move the carriage automatically during thread cutting. **7. Legs:** Legs are used to carry all the loads of the machine. They are bolted on the floor which prevents vibration. **8. Carriage :**It is situated between the head stock and tail stock. It is used to hold and move the tool post on the bed vertically and horizontally. It slides on the guide ways. Carriage is made by cast iron. **9. Apron:** It is situated on the carriage. It consist all controlling and moving mechanism of carriage. **10. Chips pan:** Chips pan is placed lower side of bed. The main function of it to carries all chips removed by the work piece. **11. Guide ways:** Guide ways take care of movement of tail stock and carriage on bed. **12. Speed controller:** Speed controller switch is situated on head stock which controls the speed of spindle. **13. Spindle:** It is the main part of lathe which holds and rotates the chuck.	
	b	**Press Forging:** The press forging is also done in closed impression dies with the expectation that the force is continuous squeezing type applied by the hydraulic press. Press forging dies are similar to drop forging dies as also the process in press forging, the metal is shaped not by means of a series of blows as in drop forging , but by means of a single continuous squeezing action. This squeezing is obtained by means of hydraulic presses. Because of the continuous action of by hydraulic presses, the material gets uniformly deform throughout its entire depth, the press forging dies with the various impression, such as fuller, bender and finisher impression properly arranged.	02 marks explanation & 02 marks for sketch.

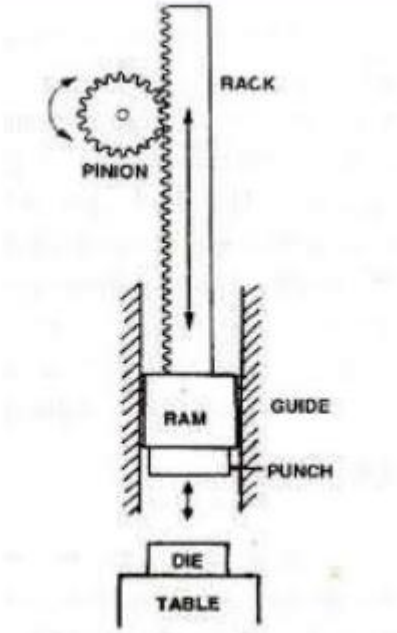


Fig. 5.48 Press Forging

c

Material Used for plastic processing

Materials

1. Acrylic (PMMA)
2. Acrylonitrile butadiene styrene (ABS)
3. Polyamide (PA)
4. Polylactic acid (PLA)
5. Polycarbonate (PC)
6. Polyether ether ketone (PEEK)
7. Polyethylene (PE)
8. Polypropylene (PP)

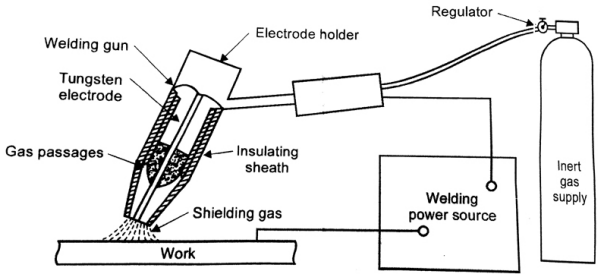
Merits

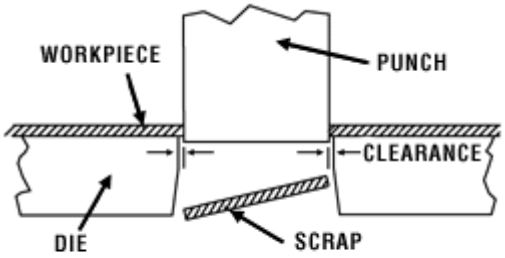
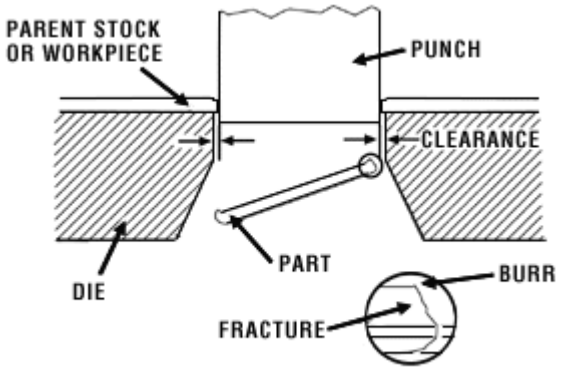
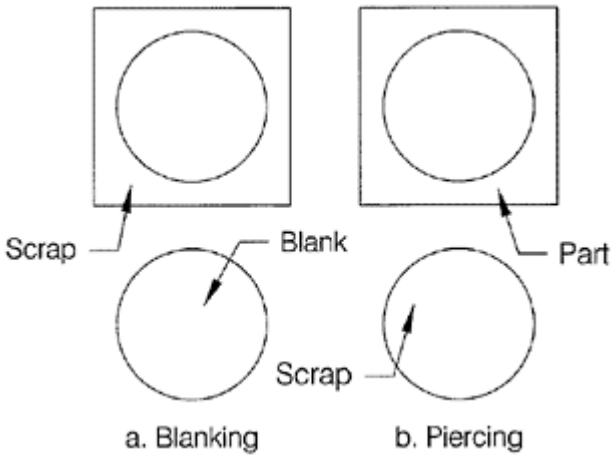
1. Lightness in weight
2. High chemical resistance
3. High corrosion resistance
4. Easy to shape and mold
5. Bad conductor of heat
6. High electrical insulation

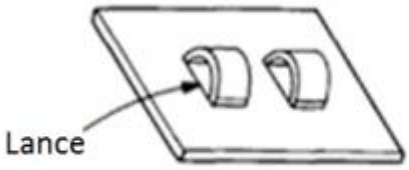
½ Mark each for any 4 points

½ Mark each for any 2 merits

½ Mark each for any 2 Demerits

		Demerits 1. a non-renewable resource 2. They pollute our environment. 3. They pose a danger to wildlife. 4. They do not degrade quickly 5. they produce toxic gases and smoke	
	d	**TIG Welding:** **Principle:** TIG welding works on same principle of arc welding. In a TIG welding process, a high intense arc is produced between tungsten electrode and work piece. In this welding mostly work piece is connected to the positive terminal and electrode is connected to negative terminal. This arc produces heat energy which is further used to join metal plate by fusion welding. A shielding gas is also used which protect the weld surface from oxidization.  	02 marks principle & 02 marks sketch.
	e	**Thermoplastics:** 1.ABS: Appliances, telephones. 2.Acrylic: aircraft canopies, windows 3.Nylon: Bearing, gear wheels. 4.Polycarbonate: Construction materials, data storage devices. 5.Polypropylene: Car batteries, piping systems. 6.Styrene: CD and DVD cases. 7.Vinyl & Polyvinyl Chloride: Drainpipes, gutters. **Thermosetting:** 1.Epoxy resin: equipment panels. 2.Melamine formaldehyde: circuit breaker. 3.Polyster resin: Cell tower tops 4.Urea Formaldehyde: disc brake piston.	½ Mark each for any 2 correct thermoplastic ½ Mark each for any 2 correct uses ½ Mark each for any 2 correct thermosetting plastics ½ Mark each for any 2 correct uses

	f	**Punching -** sheet metal cutting operation where the cut piece is scrap.  PUNCHING PROCESS Blanking - sheet metal cutting to separate piece (called a blank) from surrounding stock.  BLANKING PROCESS Piercing: Piercing is the operation in which very small holes are created in the sheet metal piece without removing any material from the sheet or by removing very little quantity of material.  Lancing: In this operation, there is a cut of sheet metal through a small length and bending this small cut portion downwards.	01 mark for each sketch 01 mark for explanation (any two)



Lancing operation

Notching:In this operation the metal pieces are cut from the edges of a sheet.

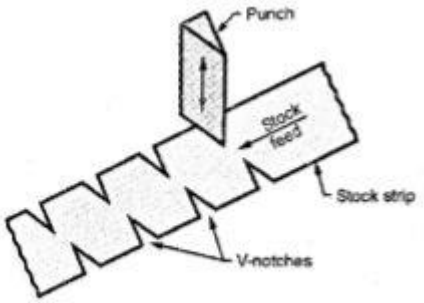


Fig. 2.6 : Notching

Notching: