SUMMER– 14 EXAMINATION

Subject Code: **17402** **Model Answer**

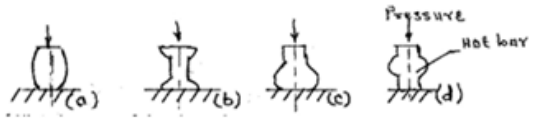
Important Instructions to examiners:

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.

Q1 a) Attempt any SIX of the following: **12 Marks**

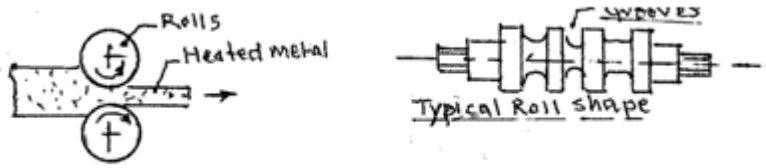
i) What is Upset Forging ?

It is the operation of increasing thickness of bar by corresponding reduction in its length. The bar is heated held on anvil, swage block or vice and end pressure is applied by hitting with a hammer. The effects produced are shown in fig (a)by heavy hammering, (b) by light hammering, (c) & (d) by local heating and hammering.



[Hint: Any one of the above fig. with explanation] **-- -- 2 Marks**

ii) Draw neat sketch of Two high rolling mill.



Sketch with labeling **-- -- 2 Marks**

iii) What is functions of flywheel in mechanical press?

Flywheel having heavy mass, it stores entire energy while the ram is in return stroke & the stored energy is released producing heavy blow on the work piece. This reduces the required power of the driving motor and also helps to maintain constant downward speed of the ram when the sheet metal is pressed between the punch & die**.** **-- -- 2 Marks**

iv) Write any four press working operations.

SUMMER– 14 EXAMINATION

Subject Code: **17402** **Model Answer**

a) Piercing- Producing hole of any shape.
b) Punching- Producing hole of cylindrical shape to a sheet, the punched out pieces are scrap.
c) Blanking- cutting sheet to desired shape, the punched out pieces are required pieces & the remaining sheet with holes is scrap.
d) Perforating- producing number of holes simultaneously.
e) Cutting off- cutting part of sheet without removing scrap.
f) Parting- cutting part of sheet by removing scrap.
g) Notching-operation of removal of the desired shape from the edge.
h) Slitting- cutting sheet metal in straight line.
i) Lancing- cutting sheet to part of its length & then bending the cut portion.
j) Bending – producing required angle to sheet by applying local pressure.
k) Curling-Operation of forming edge of a component into roll form.
l) Forming- bending sheet along curved axis.
m) Drawing operation- producing cup shaped part from a flat sheet.
n) Coining- it is squeezing operation to produce coins.
o) Embossing- operation of giving impression of figures, letters or designs by plastic flow of the material under pressure.

[Hint: any four of the above operations, Only list of operations can be given full marks.] **-- -- 2 Marks**

v) What is master pattern ?

Master pattern is used in investment mould casting also called as lost wax process. This pattern is made of wood or metal. With this pattern 'master mould' is prepared by using gelatin or low melting point alloy in the form of fine grains similar to sand moulding. The mould is split into two pieces. Pattern inside is removed out & the mould is used to make ' lost pattern' of wax.

OR – alternatively-

Master pattern is used to make a metal pattern. Patterns are made of various materials like wood, plastics, rubber & metals. When metal pattern is required for getting high accuracy, durability & strength, usually in machine moulding, it is made by using another similar wooden pattern which is known as 'Master pattern'. The poured metal shrinks during solidifications, hence the master pattern is provided with double shrinkage allowance.

[Hint : any one of the above alternative] **-- -- 2 Marks**

vi) Classify melting furnaces in casting process.

Melting furnaces are classified as-

I. Coal fired furnaces.
   1. Cupola furnace.
   2. Pit furnace.
   3. Crucible furnace.

II. Oil fired furnaces.
   1. Oil fired pit furnace.
   2. Oil fired tilting furnace.

III. Electric furnaces.
   1. Direct arc electric furnace.
   2. High frequency induction furnace.

IV. Gas fired furnaces.
   1. Open hearth furnace**.** **-- -- 2 Marks**

vii) Write any four properties of moulding sand.

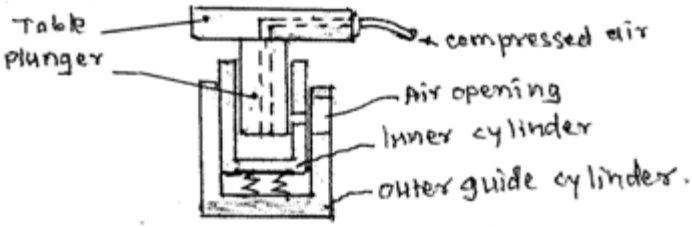
SUMMER– 14 EXAMINATION

Subject Code: **17402** **Model Answer**

1. Porosity- it is the property of sand to release the gases or moisture during pouring.
2. Flowability- ability of sand to behave like a fluid to fill all portions in the mould.
3. Collapsibility- ability of sand of free expansion during pouring & free contraction during solidification of metal without cracking.
4. Adhesiveness- property of sand particles to adhere to another body.
5. Cohesiveness- property of sand particles to stick together.
6. Refractoriness- property of sand to withstand high temperature of the melt.

[Hint- any of above 4 properties] **-- -- 2 Marks**

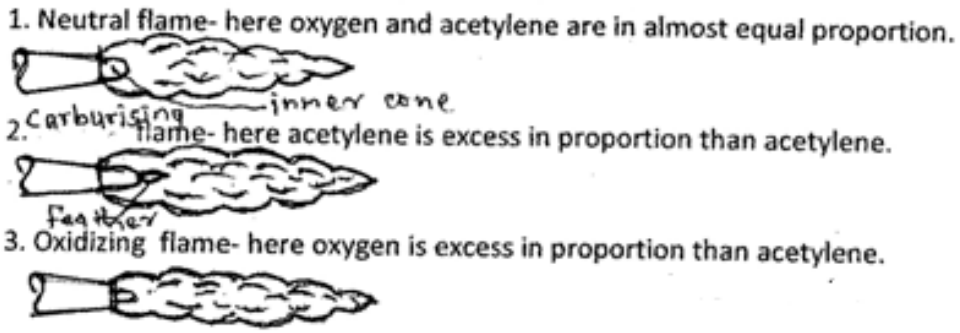
viii) Draw neat sketch of "Jolt Machine".



Sketch with labeling -- -- 2 Marks

b) Attempt any TWO of the following : 8 Marks

i) Classify various types of welding flames in gas welding with neat sketch.



Three types with labelling -- -- 4 Marks

ii) Describe taper turning operation of lathe machine by using forming tool.

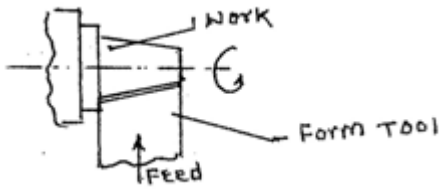


Fig 2 Marks, description 2 Marks

Here the tool cutting edge is provided angle equal to half cone angle of taper to be turned. The cutting edge length is minimum equal to the taper portion of work. It is fed straight manually into the work to produce taper. Only short length tapers can be turned as large width tool edge produce vibration & produces poor finish. Tool setting time is less & steep tapers can be turned.

iii) State different properties of plastics.

Following are the properties of plastics-

SUMMER– 14 EXAMINATION

Subject Code: **17402** **Model Answer**

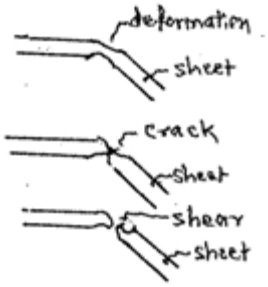
1. Impact strength
2. Abrasion resistance.
3. Heat resistance
4. Mechanical strength.
5. Rigidity.
6. Chemical stability
7. Fire resistance
8. Flow property at elevated tempt.
9. Dielectric strength
10. Density
11. Flammability
12. Toxicity
13. Vicat hardness
14. Tensile strength

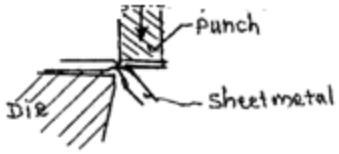
- --Any 8 properties -- 4 Marks

Q2. Attempt any FOUR of following: 16 Marks

a) Draw neat sketch of shearing operation and describe it in brief.

It is the operation of cutting the sheet generally to a straight line leaving a clean cut edge. It has three basic stages-





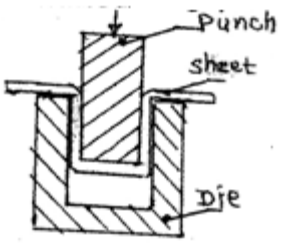
i) Plastic deformation- when pressure is applied on the sheet by the punch, the sheet gets plastically deformed reducing its thickness & elongates at the point of applying pressure.

ii) Fracture- when the punch pressure is continued, crack starts at the cutting edge at the point of greatest stress concentration.

iii) Shear- when the pressure is further continued, metal is separated at the point of fracture.

At least one main fig of shearing operation 02 marks and description-02 Marks

b) Describe drawing operation in press working.

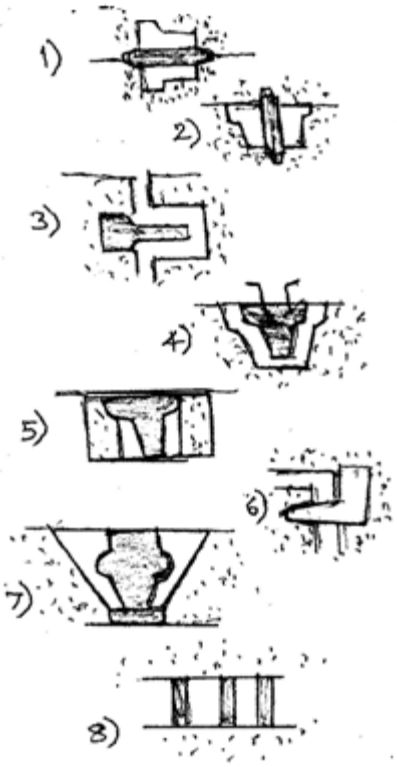


It is operation of producing cup shaped or vessel shaped parts from sheet metal using die & punch. Here sufficient clearance is provided between the punch and die to avoid shearing of sheet. The inner surface of the die is provided good surface finish to avoid tearing or cracking. Sufficient lubrication is

allowed between die and the sheet to reduce friction and smooth operation. Punch speed is maintained at desired level to avoid damage to the article. Pressure pad is used to get proper shape.

-- -- -- Fig. 2 Marks, description 2 Marks

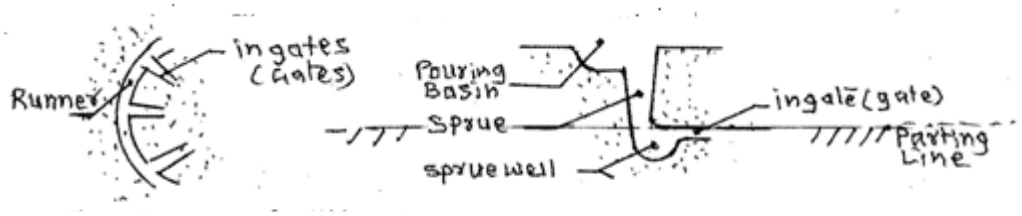
c) Explain any two types of cores with neat sketch.



1.Horizontal core- the core is laid horizontally at the parting surface in the mould and supported at the two ends in the seat provided by the core print of the pattern.
2.Vertical core- the core is placed in vertical position between cope & drag moulding box. The two ends of the core are tapered to held in its vertical position.
3.Balanced core- this core is supported at its one end only in the mould leaving its other end free like cantilever. The portion supported is made larger to get strength. It is used when the casting is required with one end opening only.
4.Hanging core- the core is supported to its one end in the cope box only & has no support in drag box mould. Steel wires or rods are used for support.
5.Cover core- the core is supported to its one end in the drag mould only.
6.Wing core- this type of core is used when the casting has opening below the parting surface.
7.Ram up core- this type of core is used when core detail is located in inaccessible area of the mould.
8.Kiss core- this type of core is used when large number of holes of less accuracy & relative spacing are required in casting. The cores are supported by pressure of cope and drag mould only and no core seat is provided at two ends like vertical core.

-- -- Any two types , each sketch 1 mark, each explanation 1 mark

d) Explain various elements of gating system in casting process.



The gating system of mould consists-

1. Pouring basin- it is funnel shaped portion at top surface of cope mould in which metal is poured. It is required to avoid turbulence & vortex of melt during pouring.
2. Sprue- vertical tapered passage through which metal passes from pouring basin to spruewell.
3. Sprue well- bottom of sprue, cup shaped which helps to retain loose sand particles which otherwise may carry out along with the melt.
4. Runner- used when large number of gates are provided to carry metal to mould cavity.
5. Gate (ingate)- it is the passage which carries the metal from runner to the mould cavity.

Any one fig with label 02 mark, explanation 02 marks

e) State the different types of dies.

Types dies according to the number of operations performed-

i. Single operation die (simple die)- which performs only one cutting or non cutting operation.

ii. Multi operation die- which performs more than one cutting or non cutting operation.

Further these are of following types-

a. Follow or progressive die – two cutting operations are performed progressively in single stroke at two different stations.
b. Compound die- two or more cutting operations are performed in single stroke at one station.
c. Combination die- two or more cutting & non cutting operations are performed in single stroke at one station.
d. Rubber die-half of the die is made of rubber which serves as universal die for non cutting forming operation.
e. Transfer Dies
f. Hydraulic Dies
g.

[Any Four of above] 4 Marks

f) Differentiate between hot chamber and cold chamber die casting (any four points)

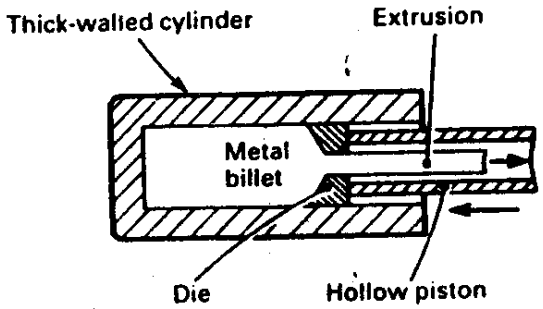
Hot chamber die casting.	Cold chamber die casting.
1. Molten metal of sufficient quantity is held in chamber.	1. Molten metal is poured by a ladle before each stroke of the plunger.
2. Plunger is immerged in the molten metal.	2. Plunger is not submerged in the molten metal.
3. Suitable for low melting point non ferrous metals like Aluminum which has no ready reactivity with the chamber which is of steel.	3. Suitable for high melting point non ferrous metals like brasses, gun metal etc. which has ready reactivity with the chamber.
4. As sufficient quantity of melt is	4. Molten metal is poured in every

held in the chamber, hence continuous strokes performed leads to higher production compared to cold chamber die casting.	stroke, hence time for each stroke being more, comparatively production rate is less.

Each point -- -- 1 Marks

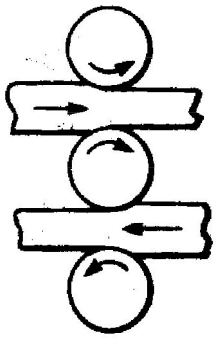
Q.3 a) (02 marks for sketch, 02 marks for explanation)

Backward Extrusion Process:- For this type of extrusion the ram or plunger used is hollow, and as it presses the billet against the backwall of the closed chamber the metal is extruded back into the plunger. As the billet does not move inside the chamber, there is no friction between them.



Indirect or backward extrusion

b) Three high roll mill:- (02 marks for sketch, 02 marks for explanation)

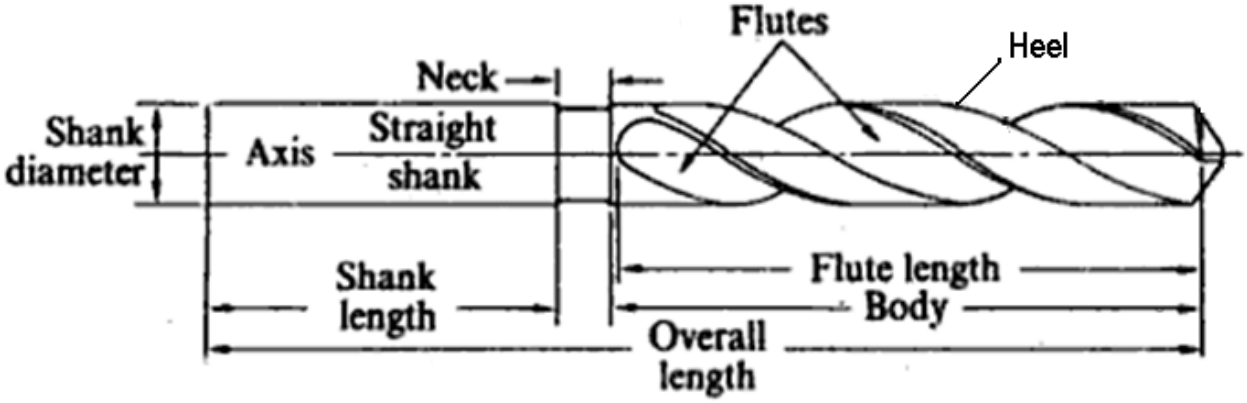


Three-high roll

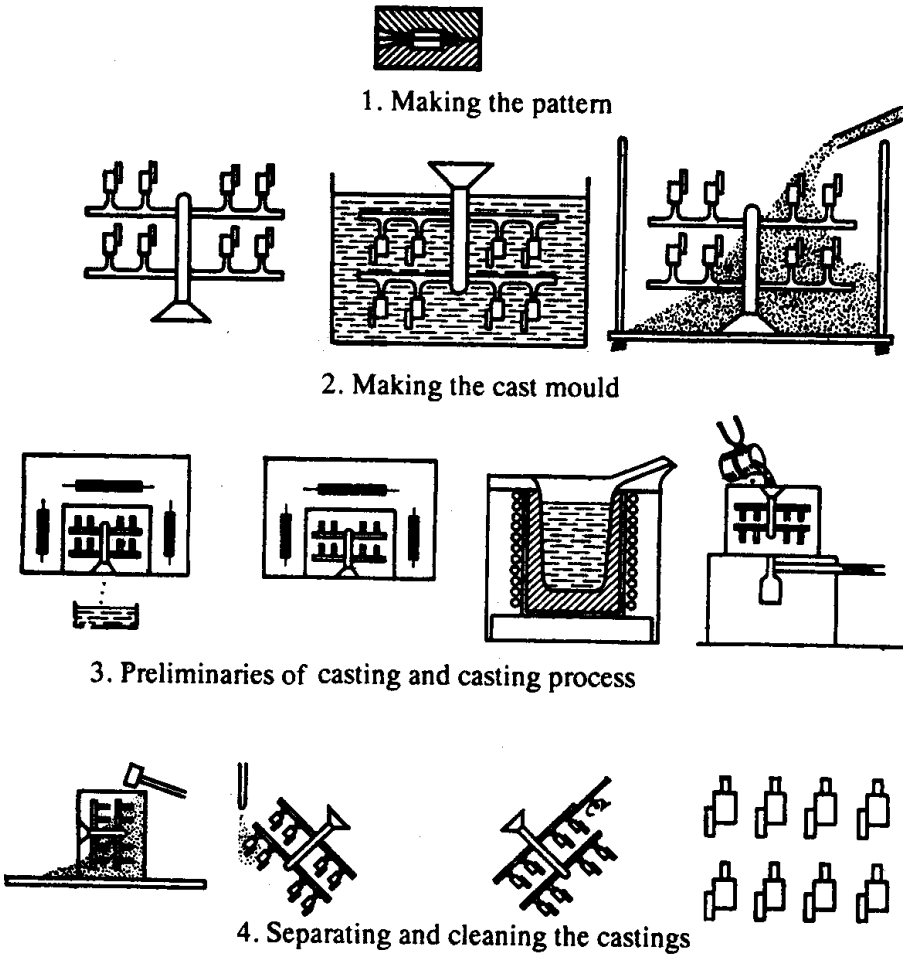
The three high rolling stand arrangement is shown in fig. it consists of three horizontal rolls, positioned directly one over the other. The direction of rotation of the upper and lower rolls are the same, but the intermediate roll rotates in a direction opposite to both of these. All the three rolls continuously revolve in the same fixed directions and never reversed. The work piece is fed in one

direction between the upper and lower rolls and in the reverse direction between the middle and lower rolls.

c) Standard Twist Drill Nomenclature:-(02 marks for sketch, 02 marks for labelling at least 4)



d) Investment Casting:- (02 marks for suitable sketch, 02 marks for explanation)

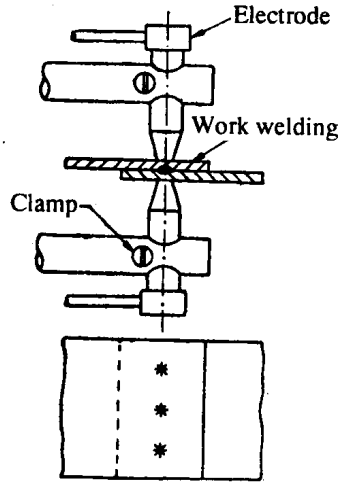


Investment moulding in stages

The stages in investment casting are shown in fig. it consists mainly of two stages first; a master pattern is made of wood or metal around which mould is formed. It does not consist of mould sand but of gelatin or an alloy of low melting point which is poured over the master pattern. This master pattern would consist of the usual two sections and thus can be opened. It is used for making the lost pattern. The master mould is filled with liquid wax, with a thermoplastic material liquefied by heating or with mercury. The heated materials become solid when they are cooled to normal room temperature.
The second pattern produced on this way is used for preparing the casting mould properly. The expandable wax pattern is coated with slurry consisting of silica flour and small amounts of kaolin and graphite mixed with water. This process is referred to as the investment of the pattern. The pattern is then used to make up moulds similar to those used in conventional moulding process.
The finished mould is dried in air for 2 to 3 hours and then baked in an oven for about 2 hours to melt out the wax. At a temperature of 100^0 to 120^0C the wax melts and runs through a hole in the bottom plate into a tray, thus providing a cavity of high dimensional accuracy for the casting process. After this the mould is sintered at about 1000^0C to improve its resistivity. Finally it is cooled down to a temperature between 900^0c and 700^0C for casting.

e) Spot Welding:- (02 marks for sketch, 02 marks for explanation)

The spot welding is used to join overlapping strips, sheets or plates of metal at small areas. The pieces are assembled and placed between two electrodes, which must possess high electrical and thermal conductivity and retain the required strength at high temperature. The electrodes are made of pure copper for limited amount of service and of alloys of copper or tungsten or copper and chromium for continuous working. When current is turn on, the pieces are heated at their areas of contact to a welding temperature, and with the application of mechanical pressure the electrodes are forced against the metals to be welded. The pressure may be developed by foot lever or by air pressure or by hydraulic cylinders.



f) Orthogonal and Oblique Cutting: (any four points, 01 mark each)

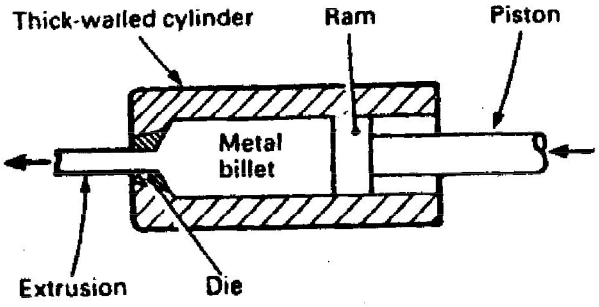
Orthogonal Cutting	Oblique Cutting
Orthogonal cutting takes place when the cutting face is 90^0 to the line of action or path of the tool.	When the cutting face is inclined at an angle less than 90^0 to the path of the tool the cutting action is known as oblique cutting.

It is also called as two dimensional cutting.	It is also called as three dimensional cutting.
The forces which cuts or shears the metal acts on the smaller area.	The forces which cuts or shears the metal acts on the larger area.
Tool used in cutting have shorter life.	Tool used in cutting have longer life.
The heat developed per unit area is high.	The heat developed per unit area is considerably small.
Chip coils in a tight, flat spiral.	Chip flows sideways in a long curl.
Removes less metal	Removes more metal in the same life as an orthogonal tool

Q.4 a) Hot and Cold rolling: (01 mark for each point)

Hot Rolling	Cold Rolling
It is carried out above the recrystallisation temperature but below the melting or burning point.	It is carried out below the recrystallisation temperature.
The purpose of hot rolling is to convert larger sections such as ingots into smaller sections which can be used either directly in as rolled state or as stock for working through other processes.	Cold working generally employed for providing a smooth and bright surface finish to the previously hot rolled steel. it is also used to finish the hot rolled components to close tolerances
Surface finish of hot rolled parts is relatively poorer due to oxidation and scaling.	Cold rolled parts have better surface finish.
Hot rolling refines metal grains, resulting in improved mechanical properties	Cold rolling processes lead to distortion of grains

b) Direct Extrusion:- (02 marks for sketch, 02 marks for explanation)



Direct extrusion

Direct extrusion process is shown in fig. The raw material used is a billet. It consists of a press operated ram and a cylinder or container into which the heated billet is placed. A dummy block is used between the ram and the hot metal. With application of ram pressure, the metal first plastically fills the cylindrical shape. And it is then forced out through the die opening until a small amount remains in the container.

SUMMER– 14 EXAMINATION

Subject Code: **17402** **Model Answer**

c) Soldering and Brazing: (01 mark for each point)

Soldering	**Brazing**
Soldering is a method of joining similar or dissimilar metals by means of a filler metal whose liquidus temperature is below 450 ^{o}c	Brazing is a method of joining dissimilar metals by means of a filler metal whose liquidus temperature is above 450 ^{o}c and is below the solidus temperature of the base metal.
The main constituent of the metals or alloy used for joining i.e solder is tin and lead	The main constituent of the metals or alloy used for joining i.e spelter is copper, zinc and tin.
The soldered joint is weaker compared to that of the brazed joint.	The brazed joint is stronger compared to that of soldered joint.
The commonly used soldering methods are with soldering iron(flame or electrically heated) dip soldering and wave soldering	Heat source used are molten bath of brazing filler metal, oxyacetylene torch, controlled atmosphere furnace, electric resistance heating and resistance heating.

d) Single Point Cutting Tool:- (02 marks for sketch, 02 marks for explanation, three views of single point tool can be given full marks)

Shank- the shank is that portion of the tool which is not ground to form cutting edges and is used for holding in tool post.

Face- It is the surface on which the chips slides upwards

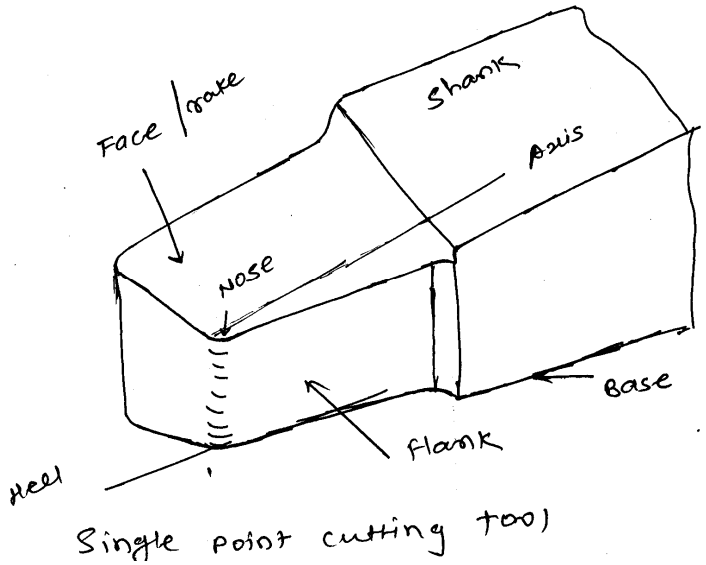
Flank- it is that surface which face the work piece.

Heel – it is the lowest portion of the side cutting and end cutting edge.

Nose – it is the intersection of side and end cutting edges.

Base- the base of the tool is the underside of the shank.

The rake- the rake is the slope of the top away from the cutting edge

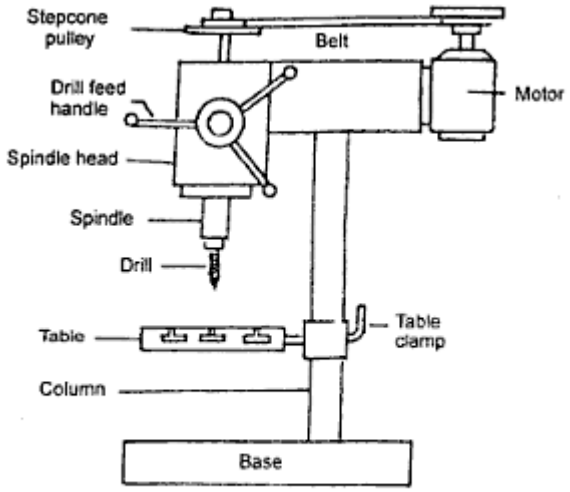


Single point cutting tool

SUMMER– 14 EXAMINATION

Subject Code: **17402** **Model Answer**

e) Sensitive Drilling Machine: :-(02 marks for sketch, 02 mark for label)



Bench type sensitive drilling machine

f) Calendering: - In this process the plastic compound is passed between a series of heated rollers. It comes out from the rolls squeezed into film or sheet. Thickness is controlled by a combination of squeezing and altering the speed of the finishing rolls. The finished product is cooled by passing though water cooled rolls**.(03 marks)**

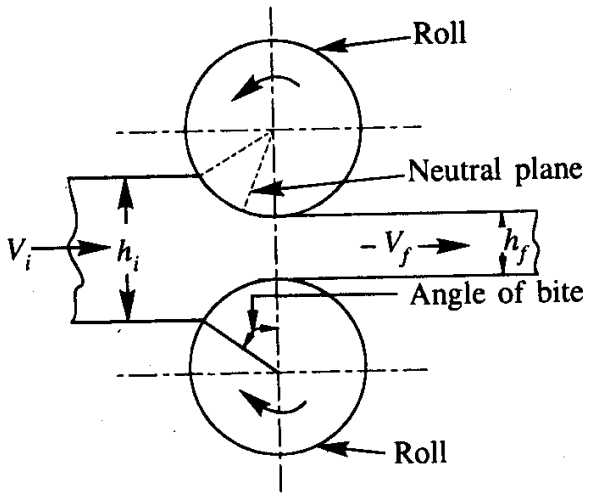
Applications:-making films,sheets, making vinyl films,coatings ,vinyl floor tiles **(01 mark)**

Q. 5 a)(any four points, 01 mark each)

Press forging	**Drop forging**
1. Slow squeezing action is produced by using a press. 2. Less vibration & shocks on the structure, foundation and nearby equipments due to squeezing operation. 3. Work need not be altered quickly as the operation is slow (squeezing) 4. Press forging produces forging effect (change of shape) to deep portion as it is slow pressing operation. 5. Press forging allows time to get forging effect with uniform structure throughout which produces more dense structure.	1. Rapid blow is produced by using mechanical hammer 2. More vibration & shocks on the structure, foundation and nearby equipments due to sudden impactive action. 3. Work should be altered quickly as the operation is of rapid blows(hammering) 4. Drop forging operation may not produce forging effect to more deep, especially for heavy jobs. 5. Drop forging does not allow time to get forging effect with uniform structure throughout, which will not produce more dense structure (excess deformation to outside with

6. The machine structure (Press) will not require heavy rigid structure. 7. Press forging is used for heavy large components.	less dense than inner portion). 6. Large dynamic impactive load requires machine structure with more rigid, strong. 7. Drop forging is used for smaller size components.

b) Explain principle of rolling with neat sketch. (02 marks for sketch, 02 marks for explanation)



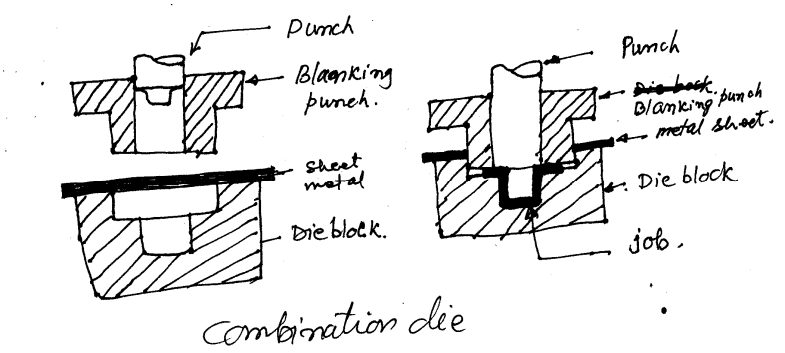
Rolling is a process where metal is compressed between two rotating rolls for reducing its cross section area. The metal is taken into rolls by a friction and subsequently compressed to obtain the final shape .The thickness of the metal that can be drawn depends on the roughness of the roll surface. The reduction that could achieve with the set of rolls is designated as the angle of bite is shown in figure. This depends on the type of rolling and the condition of the roll. The volume of the metal that enters the rolling stand should be same as that leaving it except in initial passes when there might be some loss due to filling of voids and cavities in the ingots. Since the area of the cross section gets decreased the metal leaving the rolls would be at the higher velocity than when it entered. The pressure on the rolls gradually builds up from entry to the neutral point where it is the highest and then decreases till it reaches the exit.

c) Compare Notching and Lancing. (any four points, 01 mark each)

Notching operation	**Lancing operation**
1. It is the operation of removing desired shape from the edge of a plate	1. It is operation of cutting a sheet through part of its length & then bending the cut portion.

2. Complete portion of cut portion is removed, thus scrap is produced 3. To remove the scrap produced, it is necessary to provide knockout in the die. 4. It being a cutting operation punch & die clearance provided is less similar to piercing or punching die. 5. It uses a single operation die (Cutting only) also known as simple die.	2. As the cut portion is not removed rather it is further bent producing no scrap 3. It is necessary to provide pressure pad to provide proper shape to bend portion rather knockout. 4. Out of the two edges of the punch the edge used for cutting operation is provided less clearance to perform shearing operation and the other edge that produces bending operation requires more clearance to produce bending operation. 5. It uses a multi operation die (cutting & non cutting operation) known as combination die.

d) Combination die :- (02 marks for sketch, 02 marks for explanation)

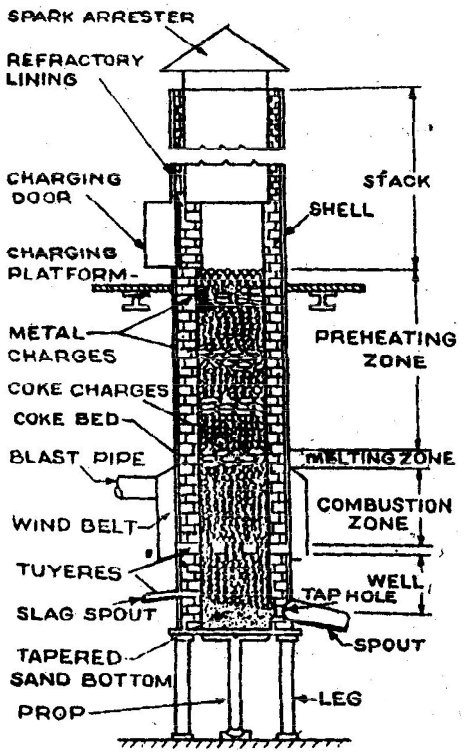


In a combination die, both cutting and non cutting operations are accomplished at one station of the press in every stroke of ram. The upper die block serves as a blanking punch, and houses a drawing punch at its center. As the punch descends, the metal plate is first sheared and the required size of the blank is obtained. The inner punch now further descends and draws out the metal while the blanking punch serves as a pressure pad. The drawn out cup is ejected at the end of the strike.

e) Zones in cupola furnace :- (02 marks for sketch, 02 mark for labeling zones)

SUMMER– 14 EXAMINATION

Subject Code: **17402** **Model Answer**



Cupola furnace

f) Casting defects (any four, 01 mark for each)

A large no. of defects are produced in sand casting due to various faults in moulding and core making materials, moulding techniques, impurities in molten metal casting process. Same of common defects found in casting are as below.

i. **Blow holes : -** It is smooth sound cavities produced in a casting due to entrapped bubbles of gases, steam. These defects are caused by excessive moisture, low sand permeability, fine sand grains & improper venting.

ii. **Drop :-** This is a irregular deformation of the casting produced when a portion of the sand drops into the molten metal. It is caused due to low strength, soft ramming insufficient reinforcement of hanging section.

iii. **Dirt :-** Presence of particles of dirt and sand in the casting. This is caused by improper handling of mould, presence of sand slag particles in molten metal.

iv. **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.

v. **Fin :-** It is a thin metal projection on casting. It is caused due to incorrect assembly of moulds and cores. Improper clamping of flasks.

vi. **Swell :-** It is un-intentional enlargement found on the casting surface due to liquid metal pressure. Swell may be caused by improper ramming, low strength of mould.

vii. **Mis-run and cold shut :-** When molten metal fails to fill the entire cavity of the mould, incomplete casting is obtained. This defeats is called mis-run and imperfect fusion of two stream of molten metal in the mould cavity results in a discontinuity called cold-shut. Both these defeats caused by lack of fluidity in molten metal , faulty dsign, improper gating.

viii. **Run out :-** This defects occurs when molten metal leaks out to the mould during pouring. It results in incomplete casting. The causes of this defect are defective moulding boxes, inadequate mould weights, clamps, excessive pouring pressure.

ix. **Warpage :-** This is unintentional and undesirable deformation of casting produced during solidification of metal. This defect is caused by inadequate and improper gating, runners and risers sed.

x. **Hot tears (Hot Cracks) :-** These are internal or external cracks resulting immediately after the solidification of metal. These defect are caused due to abrupt changes in section, poor design, incorrect pouring temp.

Q. 6 a) Electron Beam Welding:-

(03 marks for sketch,03 marks for description, 02 marks for aaplications)

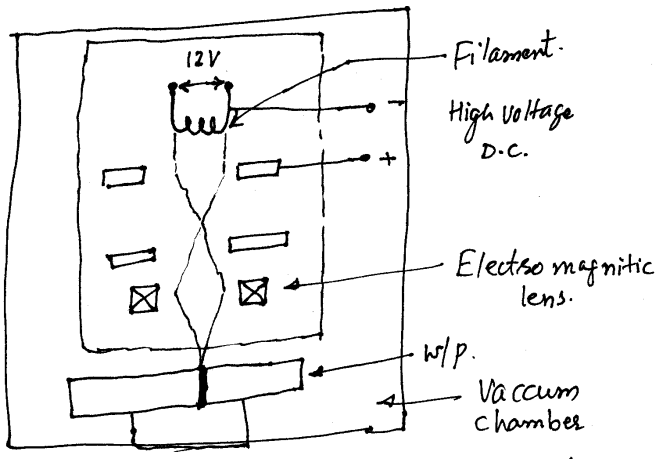
In this process the metals to be joined together are brought rather close together and concentrated stream of high energy electrons is directed into the gap and the metal causing fusion to take place.

In electron beam welding process, an electron gun is used in which electrons are emitted by a hot tungsten filament connected to a 12V supply.

The electron emitted from filament by thermionic emission is accelerated to a high velocity to the anode fed with a DC high voltage supply at 10kV to 150 kV.

The fast electrons then move through a diaphragm whose opening determines the beam width. The electron beam is then focused by a magnetic lens system on the work piece to be welded. The high kinetic energy of electron beam after impacting on job reaches high temperature which results to fusion of metal and gets welded.

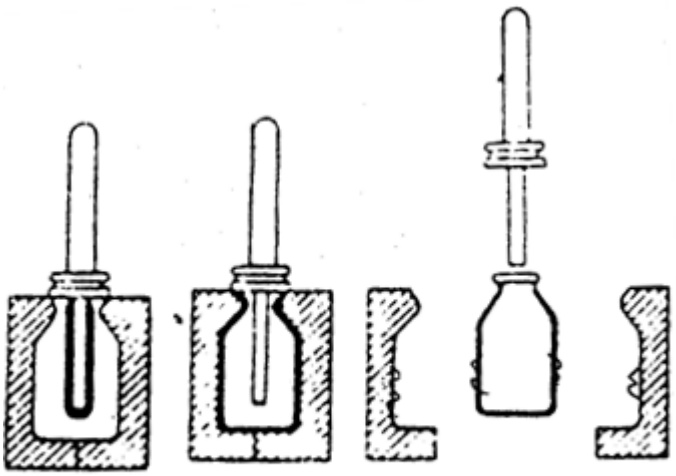
This process is best suited for reactive metals, titanium zirconium stainless steel for automotive and aerospace industry.



b) Blow Moulding:- (03 marks for sketch,03 marks for description, 02 marks for aaplications)

The blow moulding is used to make hollow article like bottles, drums, barrels and other liquid container. In this process, heated plastic tube (Parison) sticks to mould around the tube. The shape of parison stick is hollow. Air under pressure is blown through parison stick to expand the parison to required shape of the mould. After cooling, the mould is opened and the part is ejected.

Applications :- Hollow object like bottles, drums, , vessels .



Blow Mould

Blow moulding

SUMMER– 14 EXAMINATION

Subject Code: **17402** **Model Answer**

c) Drilling Operations:-(any four operations, 01 mark each for sketch & description)

i) Boring:- Boring is the operation of enlarging the previously drilled hole. The tool used is called as bore. The operation can be performed on boring, lathe or on drilling machine. The spindle speed can be same as that of employed in drilling. The coolant is necessary for the process.

ii) Reaming:- Reaming is the operation of finishing the previously drilled hole. The tool used is called as ream or reamer. As reaming is the finishing process the material removed is very small as compared to drilling. Straight as well as taper holes can be reamed

iii) Tapping:- Taping is the operation of producing threads in the dilled hole. The tool used is called as Tap. Threads produced will have the pitch same as that of the tap. Tapping can be of hand taping or machine tapping type.

iv) Counter Boring:- Counter boring is the operation of enlarging the drilled hole head to the required length.. The tool used is called as counter bore. This operation is done to accommodate the bolt heads, nuts.

v)Counter Sinking:- Counter sinking is the operation of enlarging the drilled hole head to the required length in conical shape. The tool used is called as counter sunk. This operation is done to accommodate the heads of allen bolt.