

WINTER – 15 EXAMINATION

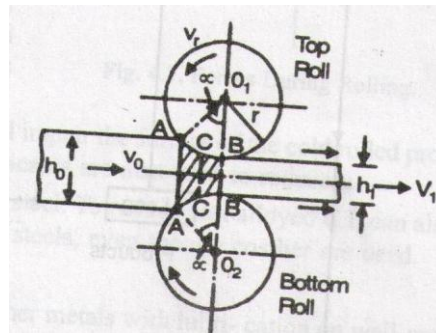
Subject Code : 17402

Model Answers

Q1 a) Attempt any six of the following

(i) State rolling principle with neat sketch

Rolling is the process in which the metals and alloys are plastically deformed into semi finished or finished condition by passing them between circular or contoured rotating cylinders. The deforming metal is subjected to high compressive force from squeezing action of the rolls.



(Description 01 mark, Sketch 01 mark)(full sketch mark is to be given even if roller's angles are not given)

(ii) Define forging operation. Classify it

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.

Classification according to forging method

Drop forging, Press forging, Hot bar forging, Upset forging, Swing forging
Cored forging, Rotary forging.

(Description 01 mark, Classification 01 mark)

(iii) Give function of flywheel in mechanical press.

It is used to supply energy for that period of operation which requires more energy and during other period it stores the energy. It also used to supply maximum tonnage at the desired need of operation.

(Description 02 mark,)

(iv) State different types of dies

WINTER – 15 EXAMINATION

Subject Code : **17402**

Model Answers

Different types of dies are i) Simple Dies ii) Compound Die iii) Transfer Dies

iv) Combination Dies v) Progressive Dies vi) Rubber Dies vii) Hydraulic Dies.

(any four types of dies two marks)

(v) Why color coding of pattern is required ?

Color coding is used to indicating different types of surfaces and parts of the patterns and core boxes. for example i) surfaces to be left un finished is shown by Black color. ii) Surface to be machined shown by Red color. iii) Core prints are shown by Yellow color. iv) Loose pieces and seats are shown by Red strips on yellow back ground. v) Stip offs are shown by Diagonal black strips on yellow base. vi) Parting surfaces are shown with no color or clear surface. By color coding operator is able to identify the operation to be performed on pattern.

Frequently, a print of finished part is not furnished with pattern. As a result the foundry man is not able to take the necessary precautions to produce the best results. Many mistakes can be eliminated by indicating the functions of various parts of pattern with proper color.

(Description 02 mark,)

(vi) Write the name of any four patterns

The various types of patterns are commonly used are

- i) Solid or Single piece pattern. ii) Split pattern
- iii) Gated pattern iv) Match Plate pattern.
- v) Cope and drag pattern vi) Loose piece pattern
- vii) Sweep pattern viii) Skeleton Pattern
- ix) Segmental Pattern. x) Shell Pattern
- xi) Follow board Pattern xii) Legged up Pattern
- xiii) Master Pattern

(any four types of patterns half marks each)

(vii) Write any four properties of moulding sand

WINTER – 15 EXAMINATION

Subject Code : **17402**

Model Answers

General 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.

(any four properties half marks each)

(viii) Classify melting furnace in casting process

The various types of melting furnaces used in foundries for melting of ferrous and non ferrous metal and alloys are.

- i) Crucible furnaces.
 - a) Pit furnaces (Coke-fired furnace)
 - b) Tilting furnaces (Oil or Gas furnace)
- ii) Metal Pot furnace
- iii) Cupola furnace

(Any 02 methods- 02 marks,)

Q1(b)

(i)

Brazing	Soldering
Temperature of filler metal is above 420°C	Temperature of filler metal is below 420°C

WINTER – 15 EXAMINATION

Subject Code : **17402**

Model Answers

Strength of joint is more	Strength of joint is Less
Filler metals Copper or Silver	Filler metals Tin and lead alloy
Cost is more	Cost is less
Used in refrigeration systems	Used in electrical and electronics systems

(any four points one marks each)

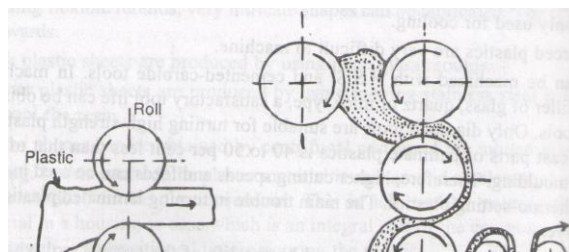
- (ii) Common methods of taper turning on lathe are
- By swiveling the Compound rest method
 - By setting over Tail stock center method
 - By Taper attachment method
 - By Form tool with broad nose method
 - By combining longitudinal & cross feed

Taper Turning by a Form Tool with broad nose: A broad nose tool having straight cutting edge (form tool) is set on to the work at half taper angle, and is fed straight into the work to generate a tapered surface. In this method the tool angle should be properly checked before use. This method is limited to turn short length of taper only. Tool will require excessive cutting pressure, which may distort the work due to vibration and spoil the work surface.

Explanation of any one of the above

(list of methods two marks, Explanation with neat sketch of any one method two marks)

(iii) Calendaring is a process in which heat and pressure are applied to a fabric by passing it between heated rollers, imparting a flat, glossy, smooth surface. During calendaring process rolls of the materials are passed between several pairs of heated rollers, to give shiny surface. Lustre (i.e. finishing) increases when the degree of heat and pressure is increased. Calendaring is applied to fabrics in which a smooth, flat surface is desirable, such as most cotton, many linens and silks and various man-made fabrics. Calendaring is also used for polymer materials. Extruded PVC Sheets are produced by this method.



WINTER – 15 EXAMINATION

Subject Code : 17402

Model Answers

(Description 02 mark, figure two marks)

Q2

a.

Notching	lancing
This is the operation of removing small amount of metal from edge of the work piece	It is the special form of piercing operation in which the entire contour is not cut, the blanked material remains attached with sheet
Bending and cutting is separate	Bending and cutting is combined
There should not be any overlapping in Notching.	It is partially punching hole then bending one side as a louver.
More cutting force is required	Less cutting force is required
Less costly die, Different types of notches are Straight Notch, Square Notch, Slant Notch, V- Notch. and wire Notch.	Comparatively cost of die is more

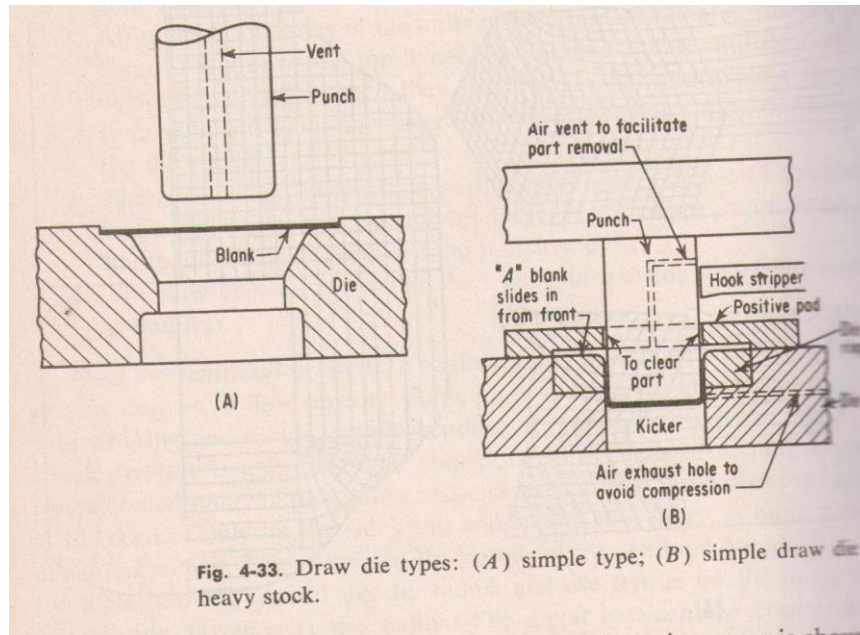
(any four points one mark each)

b. Drawing is defined as a process of making cup shaped parts from sheet metal blank by pulling it in to dies with help of punch. In drawing operation sheet blanks are in hot or cold conditions. In drawing the clearance between the punch and die is greater than the shearing.

WINTER – 15 EXAMINATION

Subject Code : 17402

Model Answers



(Description 02 mark, figure two marks)

c. It is also called lost wax method. This method involves use of expendable pattern surrounded with shell of refractory material to form casting mould. Steps in investment casting are; making master pattern, making wax pattern, making tree of wax pattern coating it with slurry of fine silica sand and water, melting out the wax pattern and baking the mould, making casting. It is generally adopted for ornaments and jewelry.

Advantages:

High dimensional accuracy and close tolerance can be achieved., Castings are free from usual defects ,Intricate shapes can easily casted., No parting line on casting.

Limitations:

The process is expensive., Only small jobs can be done.,

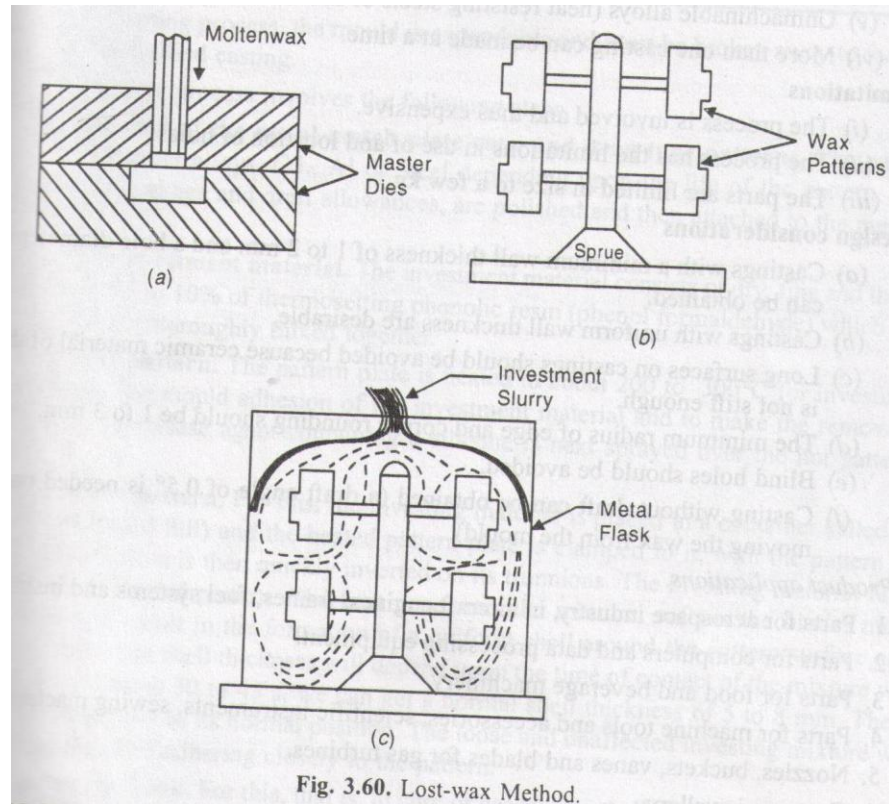
Applications:

Parts of air craft engines, Nozzles, vanes, and blades of turbines. Jewellery items parts of machine tool, instruments etc.

WINTER – 15 EXAMINATION

Subject Code : **17402**

Model Answers



(Description 02 mark, figure two marks)

d. Common casting defects are ;

Sr,no	Defects in Casting	Causes
1	Bolw holes	Excessive moisture, trapped bubbles, blow sand permeability, too hard ramming, excessive use of organic binders.
2	Dirt	Due to improper handling, slag particles
3	Drop	Low strength and soft ramming of sand. in sufficient fluxing.
4	Shifts	Mis alignment of flask and core
5	Warpage	Due to different rate of solidification.
6	Fins	Incorrect assembly of mold and core
7	Swell	Improper ramming, low strength of mold and core.
8	Mis Runs and cold shuts	Lack of fluidity of molten metal, faulty design, improper gating system.
9	Hot tears	In correct pouring temperature, poor design,

WINTER – 15 EXAMINATION

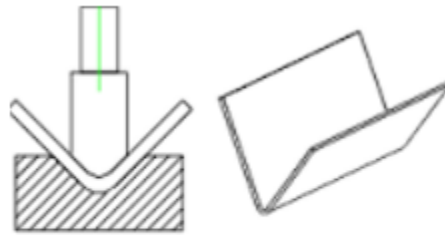
Subject Code : **17402**

Model Answers

10	Cold shuts	In complete pouring of metal in cavity of mold.
11	Scabs	By using too fine sand,,moisture content,improper ramming,low permeability sand.
12	Honey combing or sponginess	Dirt held in suspension
13	Run out	Defective molding boxes, excessive pouring pressure.

(any four defects with their causes one mark each)

e. Bend is the process involving plastic deformation in which total surface area remains constant. In bending flow of metal occurs in plastic range and there is permanent change in shape .operation of bending can be done on ram or rotary type of machine .bending is uniform straining. During the bending operation metal is subjected to tensile and compressive stresses. It is non cutting operation.



Bending

(Description 02 mark, figure two marks)

f.

Hot chamber die casting	Cold chamber die casting
1.metal pots and furnace are integral part of machine.	Molten metal is contained in a separate holding furnace.
2.it is not suitable for casting high melting point metals.	It is used for higher melting point nonferrous metals and alloys.
3.it is faster than cold chamber system	It is slower than hot chamber system
4.metal injection pressure is generally below 14 N/mm ²	Metal injection pressure is generally in range of 35 to 175N/mm ²
5. It is used to cast zinc, lead, tin alloys	It is used to cast aluminum, copper base alloys.

(any four points one mark each)

WINTER – 15 EXAMINATION

Subject Code : **17402**

Model Answers

Q 3 Attempt any four of the following

a)

S. No.	Hot Rolling	Cold Rolling
1	It is carried out above the recrystallisation temperature	It is carried out below the recrystallisation temperature
2	No internal or residual stresses are set up	Residual or internal stresses are setup in the metal
3	Improved Mechanical properties	Process leads in to distortion of grains
4	No cracks and blow holes are present in the metal	Existing cracks propagates and new cracks may developed
5	Close dimensions cant be maintained	Superior dimensional accuracy can be obtained
6	It requires less power for rolling	It requires more power for rolling
7	It is used for plates,bars,structural sections,channels production.	It is used for rods,sheets, plates bar etc.

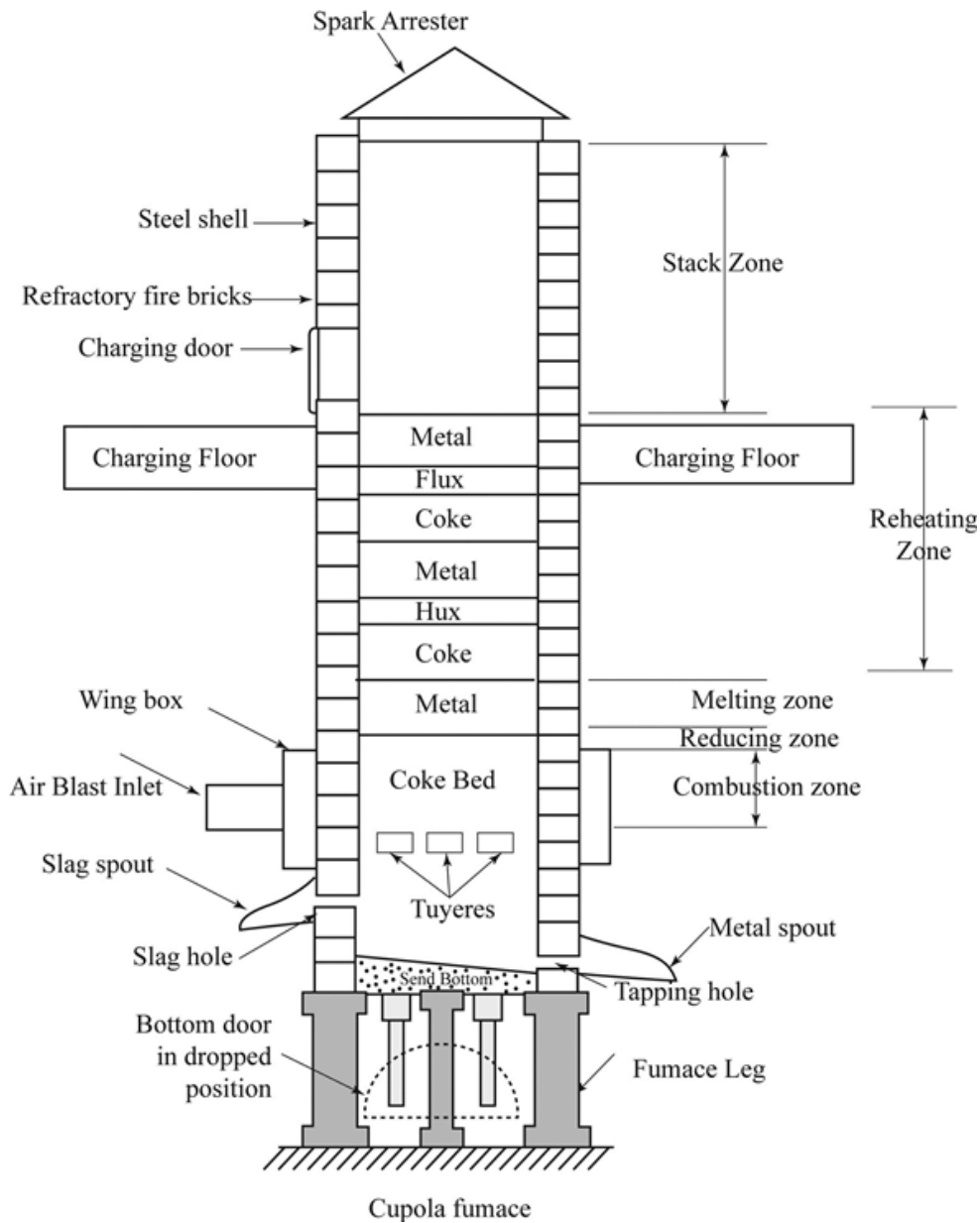
Any four related points 04 Marks

b) Sketch of Cupola

WINTER – 15 EXAMINATION

Subject Code : 17402

Model Answers



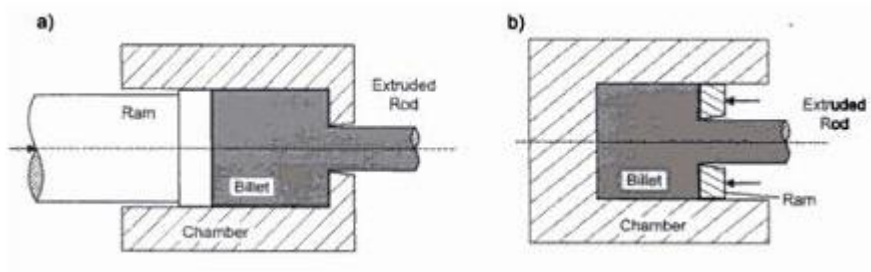
Sketch 02 Marks and Label 02 Marks

C) **Direct hot extrusion method** is the most widely used method and the maximum numbers of extrusion parts are produced by this method. The raw material used is a billet. It is heated to its forging temperature and fed in to the machine chamber; pressure is applied to the billet, forcing the material in to Die. The length of extrusion part will depend on the size of the billet and cross section of the die. The extrusion part is then cut to the required length.

WINTER – 15 EXAMINATION

Subject Code : **17402**

Model Answers



Sketch of Direct or Forward Extrusion

Explanation 02 Marks and Sketch 02 marks

d)

1. Cutting Speed (V);- In Lathe, cutting speed is defined as the speed at which the metal is removed by a tool from the work piece. It is the circumferential speed of the work against the cutting tool. It is expressed in meters per minutes..

If D= Dia of Job in mm & N= spindle or job speed in RPM then cutting speed v is given by $V = \pi DN / 1000$ met/min.

2. Feed (f):- In lathe , it is the advancement of tool per revolution of job parallel to the surface being machined. It is given in mm/rev of the job.

3. Depth of Cut:- It is the perpendicular distance measured between machined surface and un machined surface in case of lathe machine.

Let, D1-diameter of the work before machining

D2- diameter of the machined surface.

Then, Depth of Cut= $(D1 - D2) / 2$

02 Marks to Cutting speed and 01 to feed and 01 to depth of cut

e)

S. No.	TIG Welding	MIG Welding
1	Electrode is made of Tungsten	Electrode is made of Metal generally of base metal
2	Electrode is non	The metal electrode is consumable

WINTER – 15 EXAMINATION

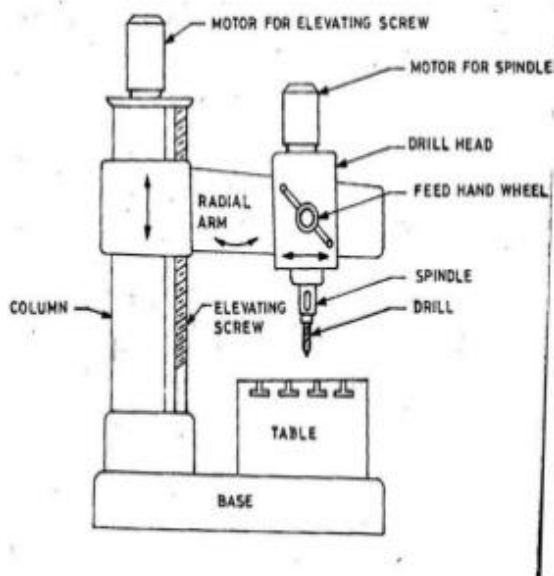
Subject Code : **17402**

Model Answers

3	consumable The electrode holder is simple	The electrode holder is complicated due to feed mechanism
4	Tungsten may get transferred into weld metal	No change of tungsten inclusion in the weld metal
5	Electrode advancing mechanism is not required	Electrode advancing mechanism is required
6	In this welding generally Electrode is negative and work piece positive	In this electrode positive and work piece negative

Any four related points 04 Marks

f) Radial Drilling Machine



Functions of all elements

Spindle/Drill Head:- To provide variable speed to spindle.

Radial arm :- To provide radial movement of the drilling head along with drilling spindle around the column.

WINTER – 15 EXAMINATION

Subject Code : **17402**

Model Answers

Base :- It is the foundation on which all the parts of machine are mounted & it supports the Work piece table .

Column:- To support the radial arm, which can be raised or lowered to accommodate jobs of different heights.

Sketch 02 Marks and 02 for at least four functions

Q4- Attempt any Four of the following

a) Press forging & Drop forging comparison

S. No.	Press Forging	Drop Forging
1	In this process steady pressure is applied slowly over the metal so that metal is slowly and gradually take final shape. It is also called as die forging.	In this process metal fills in the cavity of die completely and it takes the final shape after giving the impact.
2	More complicated shapes can be forged	It is used for simple shape production
3	The life of dies and press is more as compare to drop forging.	The life of dies and press is less as compare to press forging due to repeated blows/impacts..
4	The press forging is faster than drop forging and cost of operation also lower.	The drop forging is slower than press forging ,as total change is not achieved in one blow. Hence cost of operation is more.
5	Highly skilled operator not required.	Required skilled operator
6	Less vibrations are observed	More vibrations are observed

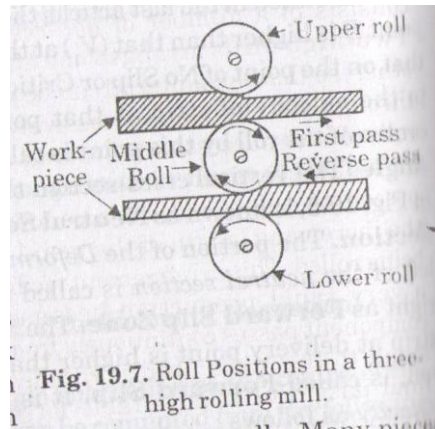
Any four related points 04 Marks 01 mark each each point

WINTER – 15 EXAMINATION

Subject Code : 17402

Model Answers

b) **Three Roll High Mill** -It consist 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 apposite to both of these . all the three rolls continuously revolve in the same fixed directions and are never reversed. The work piece is fed in one direction between the upper and middle rolls and in the reverse direction between the middle and lower rolls. Many pieces may be passed through the rolls simultaneously. This results in a higher rat of production than the Two High Mill. This mill may be used for blooming, billet rolling or finished rolling



Explanation 02 marks

Marks and Sketch 02

c) Electric Arc

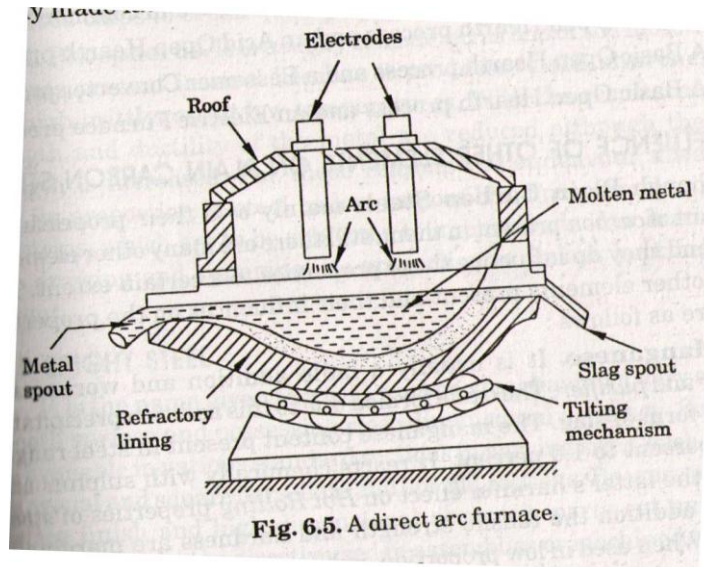
furnace

It consists of a steel shell having a spherical bottom as shown in figure. The complete furnace is mounted on rollers, so that it can be tilted for pouring the melt in to the ladle. The hearth inside has a bowl shape and is provided with basic lining with mangesite or dolomite. Two spouts are provided on opposite side, one for the slag and other for the molten metal. The roof is of detachable type and the charge is fed through it. Three vertical electrodes are suspended through the top, through which a 3 phase current is led in the furnace. These electrode can be raised up or lowered as desired. After charging the furnace top is closed and the electrode lowered. The current is switch on to generate the arc, There by producing a high temperature of 2000 degree temp or above this intense heat melts charge.

WINTER – 15 EXAMINATION

Subject Code : 17402

Model Answers



Explanation 02 Marks and Sketch 02 marks

d) Nomenclature of twist drill:-

Axis: The imaginary straight line which forms the longitudinal center line of the drill

Back Taper: A slight decrease in diameter from front to back in the body of the drill

Body: The portion of the drill extending from the shank or neck to the outer corners of the cutting lips

Body Diameter Clearance: That portion of the land that has been cut away so it will not rub against the walls of the hole

Built-Up Edge: An adhering deposit of nascent material on the cutting lip or the point of the drill

Cam Relief: The relief from the cutting edge to the back of the land, produced by a cam actuated cutting tool or grinding wheel on a relieving machine

Chip Breaker: Nicks or Grooves designed to reduce the size of chips; they may be steps or grooves in the cutting lip or in the leading face of the land at or adjacent to the cutting lips

Chip Packing: The failure of chips to pass through the flute during cutting action

Chipping: The breakdown of a cutting lip or margin by loss of fragments broken away during the cutting action

Chisel Edge: The edge at the end of the web that connects the cutting lips

Chisel Edge Angle: The angle included between the chisel edge and the

WINTER – 15 EXAMINATION

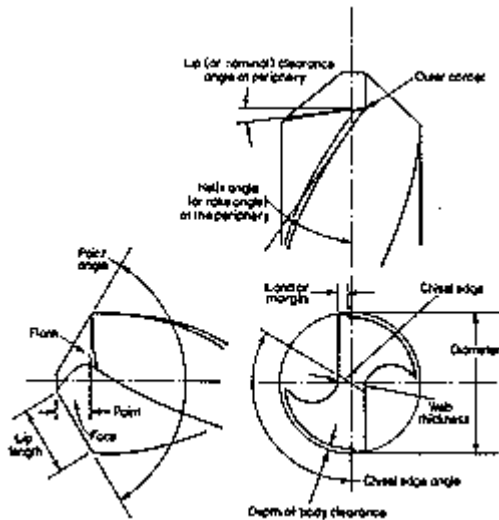
Subject Code : 17402

Model Answers

cutting lip, as viewed from the end of the drill

Clearance: The space provided to eliminate undesirable contact between the drill and the workpiece

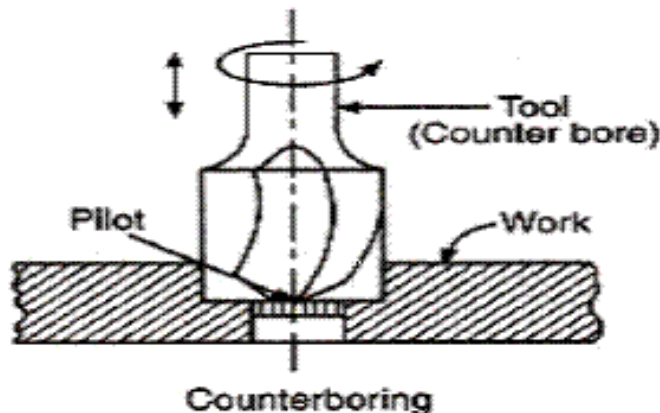
Clearance Diameter: The diameter over the the cut away portion of the drill lands



Crankshaft or Deep Hole Drills: Drills designed for drilling oil holes in crankshafts, connecting rods and similar deep holes; they are generally made with heavy webs and higher helix angles than normal

Explanation 02 Marks and Sketch 02 marks(fig. showing 02 views i.e.body and side views should also be given full marks.)

e) Counter Boring Operation:-



Counter boring is the operation of enlarging the hole cylindrically to a certain depth only. Counter boring produces a stepped hole with square shoulders. This is necessary to accommodate the heads of bolts.,studs and pins. The tool used for counter boring is called counter bore. It

WINTER – 15 EXAMINATION

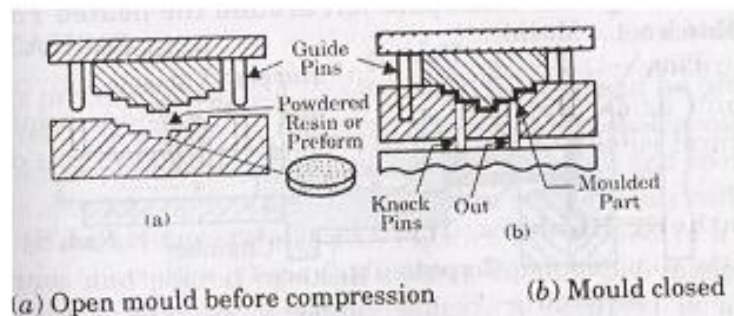
Subject Code : 17402

Model Answers

enlarges the predrilled hole a required depth. The cutting edges of the counter bore may be straight or spiral. Tool used for counter boring are small holes need a pilot at the front end. The tool can be in single piece or may have inserted cutters. The pilot can also be either a single piece with the tool or of replaceable type. The cutting speed for counter bore is about $\frac{3}{4}$ th that of drilling speed and the accuracy obtained is of order of 0.05 mm. The figure shows the counter bore.

Explanation 02 Marks and Sketch 02 marks

f) **Compression Molding**:- The process Consists of placing a correct amount of plastic compound in a heated mould cavity. Temperature varies between 135° to 160° C. A punch called force compresses the compound from top in to the required shape and density. The pressure is around 30 N/mm^2 to 60 N/mm^2 The mould is kept closed for sufficient time to allow the chemical change to complete, so that the product is sufficiently hardened. Tool is lubricated for next moulding. Application: This process is used for making toilet seats and covers, cups and plates and electrical switches.



Explanation 02 Marks and Sketch 02 marks

5(a) open die forging is the process of deforming a piece of metal between multiple dies that do not completely enclose material.

The metal is altered as the dies hammer the material through a series of movements. Until desired shape is achieved

Products formed through open die forging needs secondary machining.

Open die forging used for short run forgings of parts that are simple

The repeated working of the material through this process increases strength of grain structure

It reduces voids. The operations in open die forging are up setting, drawing out , bending, piercing, spreading etc. If the open die is used in smith forging, by hand on

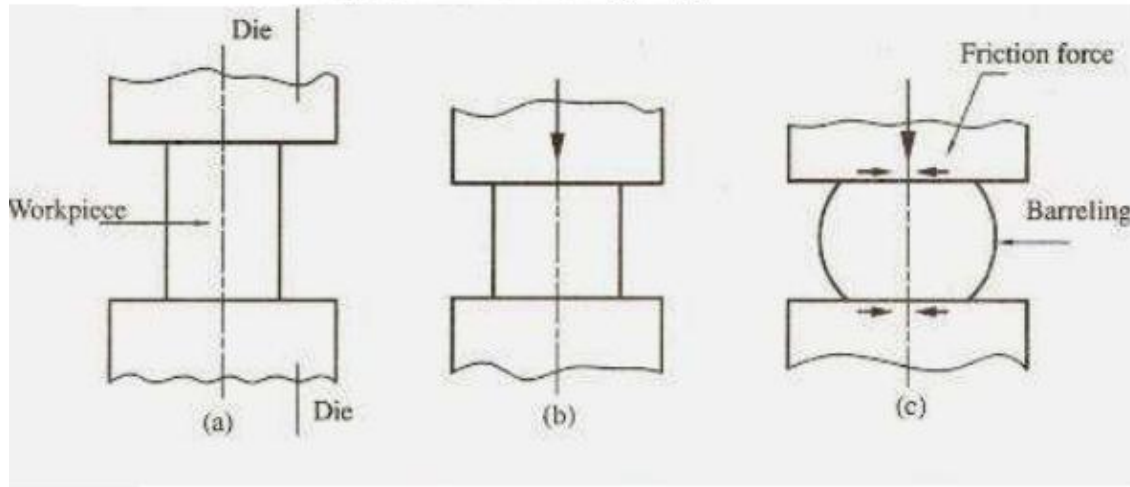
WINTER – 15 EXAMINATION

Subject Code : 17402

Model Answers

anvil, then process is called as Hand forging. And when open die is used in press then it is called press forging. The main advantage of open die is its very low cost

Open Die Forging



Description 02marks

Figure 02 marks

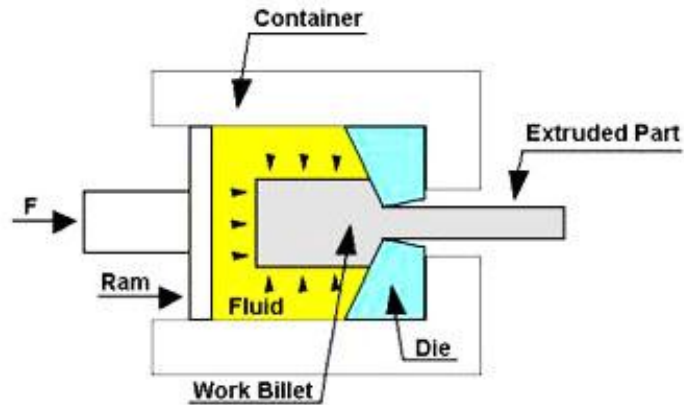
5 b) The equipment consists of a cylinder or container into which the heated metal billet is loaded. One end of the container, the die plate with necessary opening is fixed. From the other end plunger or ram compresses the metal billet against the container walls and die plate, thus forcing it to flow in the forward direction through the die opening.

Acquiring the shape of the opening the extruded metal is then carried by the metal handling system as it comes out of the die. A dummy block which is a steel disc of about 40mm thick with a diameter slightly less than container is kept between the hot billet and the ram to protect it from heat and pressure. In direct extrusion, the problem of friction is prevalent because of the relative motion between heated metal billet and cylinder walls. To reduce this friction lubricants are to be used. To reduce the damage to equipment, extrusion is finished quickly and the cylinder is cooled before further extrusion.

WINTER – 15 EXAMINATION

Subject Code : 17402

Model Answers

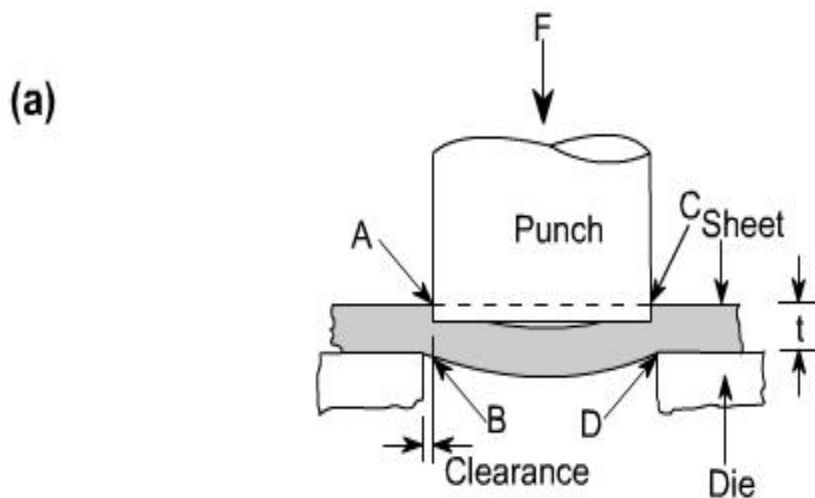


Description 02marks

Figure 02 marks (All line diagrams should be given full marks)

5(c) shearing operation-

- as punch descends upon work piece ,the pressure exerted by the punch causes the metal to be deformed plastically in die.
- as clearance between the punch and die is very small the plastic deformation takes place in localized area and metal adjacent to the cutting edge of punch and die becomes highly stressed.
- when the stress reaches beyond the ultimate strength of material the fracture starts from both sides of plate .
- punch continues to descends the fracture meets at the centre of plate.
- the metal is completely severed from sheet metal.



Description 02marks

Figure 02 marks

WINTER – 15 EXAMINATION

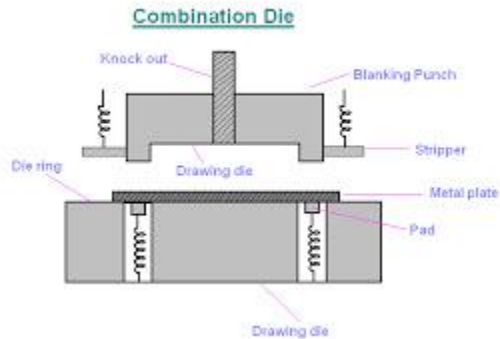
Subject Code : 17402

Model Answers

5(d)combination die-both cutting and non cutting operations are performed at one station of the press in every stroke of ram.

figure shows blanking and drawing die.

- a blanking punch and houses a drawing punch at its centre.
- as the punch descends the metal is sheared first and required size of blank is obtained.
- the inner punch I now descends and drawn out the metal
- the blanking punch serves as pressure pad
- the drawn out cup is ejected at the end of stroke



Description 02marks

Figure 02 marks

5(e)

Elements of gating system

Gating system means all passages through the molten metal enters the mould cavity.

Pouring basin –from where molten metal is drained

Runner –it is a passage which connects basin and gate

Gate it is passage which connects runner and mould cavity.

Riser-after cavity is completely filled liquid level rises in riser passage and draining can be stopped.

04 points

04 marks

5(f)Types of cores

1) Horizontal core 2)vertical core 3)balanced core 4)hanging and cover core 5)A stop off core

1) Horizontal core-

It is most common and simple type core.

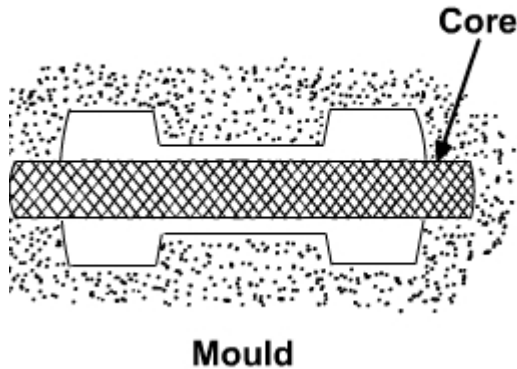
It is assembled in mould with its axis horizontal

WINTER – 15 EXAMINATION

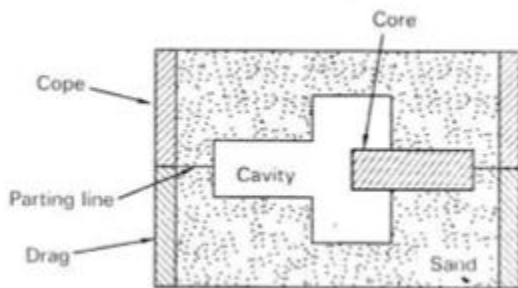
Subject Code : 17402

Model Answers

It may have any cross section but mostly cylindrical.
The core is supported in mould at both ends



2) balanced core –it is used to produce a blind hole along horizontal Axis.
It is similar to horizontal one with exemption that it is supported only at one end and other end remaining free in mould cavity.
Since it has to support the weight of the overhanging portion. the core print provided on pattern should be long enough so that sufficient length of core may be embedded in the sand to balance the weight of over hang.



Core name 02 marks

Sketch 02 marks

6(a)(i)projection welding

This is a type of resistance welding .This process is a modification of spot welding, in which the current and pressure are localized at the weld points.In this process The surface of work piece are in contact with each other only at projections.

WINTER – 15 EXAMINATION

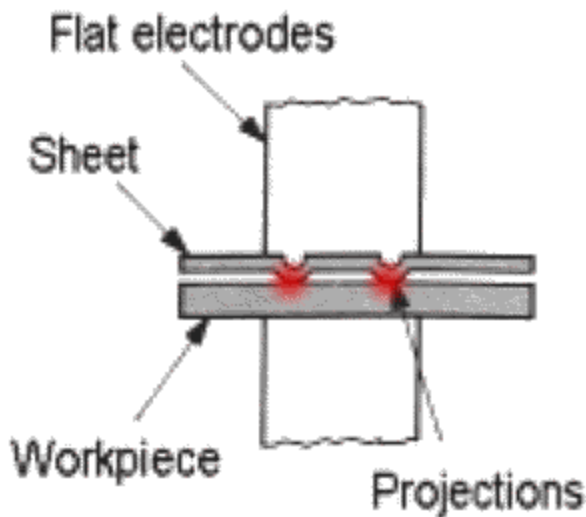
Subject Code : **17402**

Model Answers

The welding is done in après type of machine with electrodes in the form of platens which can distribute the current and pressure equally on the sheets. The advantage of this type of welding is that the number of spot welds can be made simultaneously. The electrodes in this method have a long life. But current and pressure for this type is heavy.

Application: Sheet metal parts in automobile and aero plane are welded by this method.

Brass and copper collapse under pressure hence can not be weld by the projection weld method.



Description 02marks

Sketch 02 marks

(ii)seam welding-

It is a type of resistance welding. Seam welding gives a continuous spot weld. The current is passed through the overlapping metal sheets which are hold together under the pressure between the two roller types of electrodes. The upper or lower or both the electrodes are motor driven.

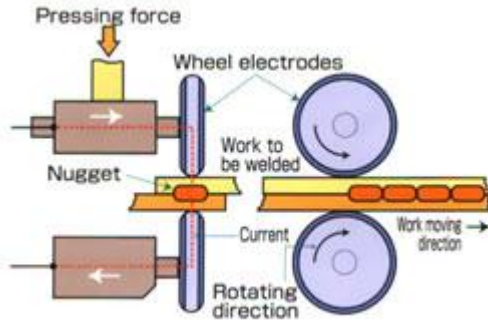
Due to wheels ,the weld produced is continuous instead of being intermittent.

In operation the current is switched on and metal pieces pushed together to travel between the revolving wheel electrodes under constant pressure. The controlling current and speed of the roller /wheels is depends on the thickness of the sheets to be weld.

WINTER – 15 EXAMINATION

Subject Code : 17402

Model Answers



Application :-It is used in parts requiring pressure tight and leak proof such as metal containers, pipes, tanks

Description 02marks

Sketch 02 marks

6(b) Injection moulding

Injection molding a manufacturing process in which melted plastic is forced into a mould cavity. When it is cooled, the mold is then opened, the part is removed, the mold closed again and the cycle is repeated. The basic process is very simple. The process can be used for manufacturing very small object like a washer to a large objects Ex. Plastic thread caps, caps for master cylinder reservoir, caps for hoses, plastic switches. Mobile covers, trays etc

The granular plastic moulding material soften when heated and re harden when cooled.

No chemical change takes place due to heating or cooling of metals, only physical change takes place.

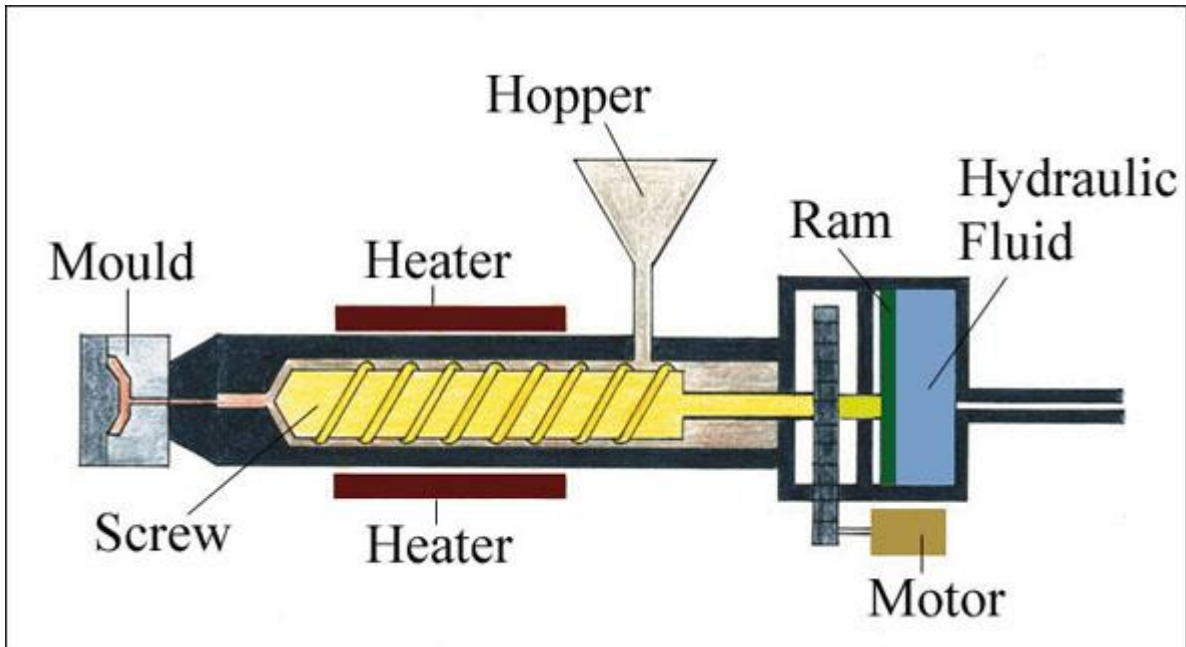
The granular moulding material is loaded into hopper and from where in it is metered out in heating Cylinder by feeding screw.

Exact amount of material is delivered into cylinder which is required to fill the mould cavity completely Injection ram pushes material into heating cylinder through nozzle and into closed mould. The mould is cooled and piece ejected. The working temperatures used as ranging from 225° to 300° C and Injection pressure range from 35-140MPa.

WINTER – 15 EXAMINATION

Subject Code : 17402

Model Answers



Application

It includes making of toys, houseware buckets, bowls, washing machine parts and car components, electric switches. Etc.

Injection moulding 02 marks

Sketch 04 marks

Application 02 marks

6(c) Taper turning may be defined as a uniform increase or decrease in diameter of a work piece measured along its length .

Taper turning means to produce a conical surface by gradual reduction in diameter from a cylindrical work piece.

$\tan\theta/2 = \frac{D-d}{2L}$ Where D is Larger Diameter, d is smaller diameter and L is length of taper.

$$= \frac{30-20}{2}$$

$$= \frac{5}{40}$$

$$= 0.125$$

$$\theta/2 = 7.95^\circ$$

Definition of taper- 02

Formula 01marks

Complete with Answer 04 marks