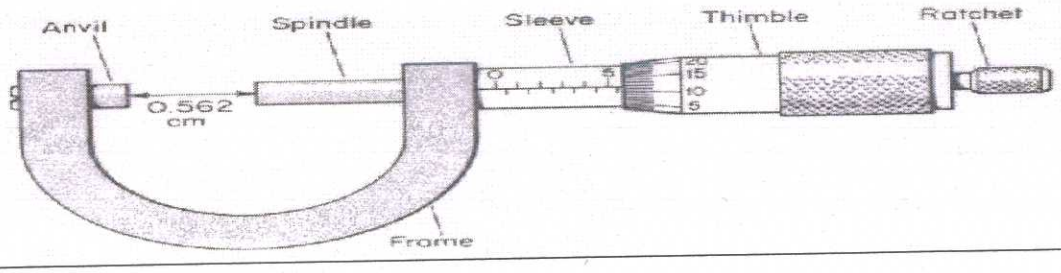
Scoring Indicators

Code : 3023 **Manufacturing Process**

Qn. No.	Scoring Indicators	Split score	Total Score
I (1)	A **gauge** is a tool to measure or compare a component	2	2
I (2)	• Vernier • Micrometer	1×2	2
I (3)	An **electrode** is used to conduct current through a work piece to fuse two pieces together	2	2
I (4)	A regular, indefinitely repeated array of points in three dimensions in which the points lie at the intersections of three sets of parallel equidistant planes.	2	2
I (5)	• Single Piece Pattern • Split Pattern • Cope and Drag Pattern • Match Plate Pattern • Loose Piece Pattern • Gated Pattern • Sweep Pattern • Skeleton Pattern	2×1	2
II (1)	**Line Standard:** When the length being measured is expressed as the distance between two lines, this is known as, obviously, line standard. Imperial Standard Yard and International Standard Meter are the line standards both comes under primary standard of length measurement. Measuring scale and tapes are also line standards and comes under working standards of length measurement. This form of measurement is not very convenient to use. Measurement of length with scale is an example of line standard. **Eng Standard:** When the length being measured is expressed as the distance between two surfaces or ends, this is referred as, obviously, end standard. Slip gauges, end bars, micrometers etc. are comes in this category. The end faces are hardened, lapped flat and parallel to a very high degree of accuracy. This form of measurement is very convenient to use in tool-rooms, laboratories, workshops etc. It is difficult to convert between line measuring system and end measuring system. For Example, a line measuring device (say scale) is not suitable for the direct measurement of distance between two edges or surfaces. Similarly, an end measuring device (say slip gauges) are not suitable for the measurement of distance between two lines. So the selection of measuring device depends upon the each particular situation of measurement.	3 3	6
II(2)		6	6

II(3)

Comparison between AC and DC welding:-

AC WELDING:-

1. Equipment is cheaper and simpler.
2. In AC transformer there is no moving part, therefore it is easy to maintain.
3. It can be operated at large distances from power sources as the voltage drop is negligible.
4. Only coated electrodes can be used in AC welding.
5. Less problem of arc blow.
6. It cam not be used for welding non-ferrous metals.
7. It can be used only when AC current is available.

3

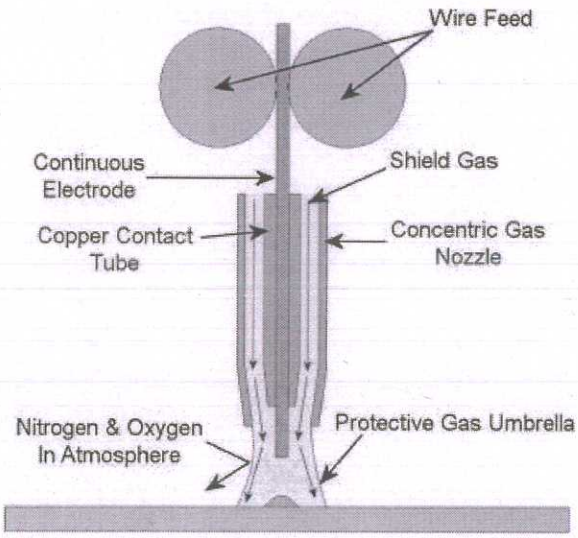
6

DC WELDING:-

1. Equipment is costlier and complicated.
2. DC generator set has many parts moving and its maintenance cost is higher than AC transformers.
3. In DC the voltage drop is very high. Therefore shorter cables are used.
4. Both coated and bare electrods can be used.
5. More problem of arc blow.
6. Almost all the metals can be welded.
7. An engine generator can be used in case of non-availability of AC power.

3

II(4)



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MIG welding is an arc **welding** process in which a continuous solid wire electrode is fed through a **welding** gun and into the **weld** pool, joining the two base materials together. A shielding gas is also sent through the **welding** gun and protects the **weld** pool from contamination. In fact, **MIG** stands for metal inert gas.

3

II(5)

Comparison # Press Forging:

1. In press forging, the metal is shaped by means of a single, continuous stroke.
2. The pressure applied is slow, steady and continuous in a single squeezing action in press forging.
3. The deformation obtained is uniform, simultaneous and deep penetrating at the centre of the metal part.
4. The impressions obtained in press forging are clean.
5. In press forging, the draft angles used are less.
6. The tong holds are not required.
7. The initial cost is higher than the drop forging.
8. The process is recommended when machine utilization is quite high.
9. The process forging is a faster process and has higher production rates.

3

Comparison # Drop Forging:

1. In drop forging, the metal is shaped by means of a series of blows.
2. The pressure applied is impact, and in multi-stroke in drop forging.
3. The deformation of metal is more at the surface layers than that of centre of the metal part.
4. The jarred impressions are obtained.
5. In drop forging, the draft angles used are more than that of press forging.
6. Tong holds are normally required for manipulating dies.
7. The initial cost is less comparatively.
8. The drop forging is suitable for almost all types of medium size forgings.
9. The drop forging is relatively slow process and has moderate production rates.

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II(6)

POINT DEFECTS

Point Defects are the irregularities or deviations from ideal arrangement around a point or an atom in a crystalline substance.

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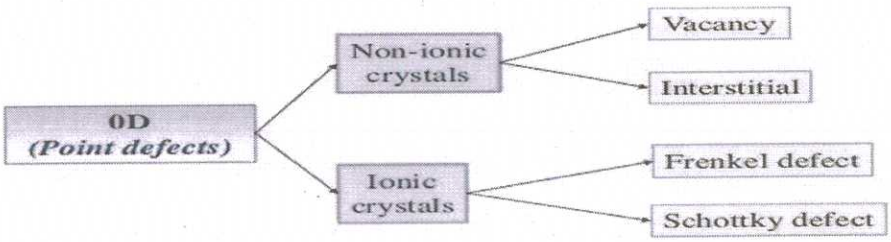

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II(7)

Refractoriness

Refractoriness is the property of sand to withstand high temperature of molten metal without fusion or soften. Moulding sands with poor refractoriness may burn when the molten metal is poured into the mould. Usually, sand moulds should be able to withstand up to 1650°C.

2

Permeability

Permeability is a property of foundry sand with respect to how well the sand can vent, i.e. how well gases pass through the sand. And in other words, permeability is the property by which we can know the ability of material to transmit fluid/gases.

2

6

Cohesiveness

Cohesiveness is the property of sand to hold its particles together. It may be defined as the strength of the moulding sand. ... Insufficient strength may lead to a collapse in the mould particles during handling, turning over, or closing.

2

III(a)

Plug Gauge:

A plug gauge is a cylindrical type of gauge, used to check the accuracy of holes. The plug gauge checks whether the whole diameter is within specified tolerance or not. The 'Go' plug gauge is the size of the low limit of the hole while the 'Not-Go' plug gauge corresponds to the high limit of the hole.

2

Ring Gauge:

A ring gauge is in the form of a ring, used to check the shafts and male members. The "Go' and 'Not Go' members may be separate or in a single ring. The opening or hole in the Go gauge is larger than that in the Not-Go gauge.

2

Snap Gauge:
A snap gauge is a U-Shaped frame having jaws, used to check the accuracy of shafts and male members. The snap gauge checks whether the shaft diameter is within specified tolerances or not.
The 'Go' snap gauge is the size of the high (maximum) limit of the shaft while the 'Not-Go' snap gauge corresponds to the low (minimum) limit of the shaft.

2

8

Thread Gauge:
A thread gauge, also known as a screw gauge or pitch gauge, is used to measure the pitch or lead of a screw thread. ... This tool is not used as a precision measuring instrument, rather it allows the user to determine the profile of the given thread and quickly categorize the thread by shape and pitch.

1

Slip Gauge:
Slip gauges were first developed by Johnson, and sometimes also called as 'Johnson Gauge Blocks'. These are rectangular blocks of steel having a cross-section of about 32 mm x 9 mm.

1

III(b)

Pneumatic Comparator

When air passes through the narrow constant space: between nozzle and the workpiece the pressure of air remains constant. If the space between nozzle and workpiece changes, it causes change in the pressure of the air. This change in pressure is utilized to measure the deviation of the dimension being measured from the standard dimension.

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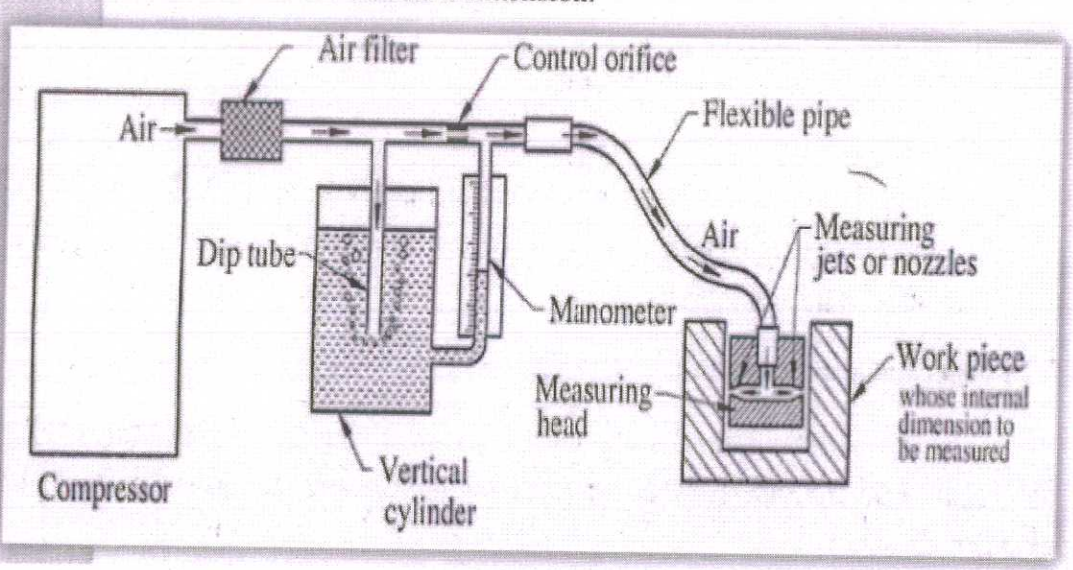

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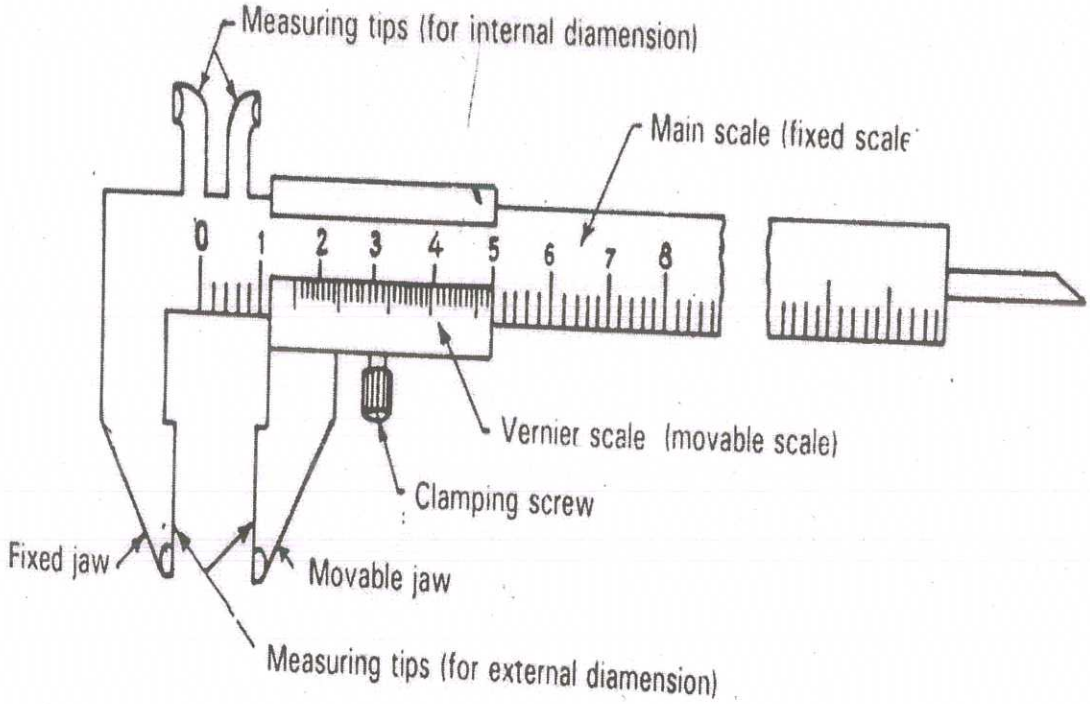
IV(a)



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IV(b)

An **electrical comparator** consists of a base a stand, power unit, measuring unit, indication unit and amplification unit. In this **comparator**, the measuring contact movement is changed into an **electrical** signal and then this signal is recorded by a device that can be adjusted in terms of plunger movement.

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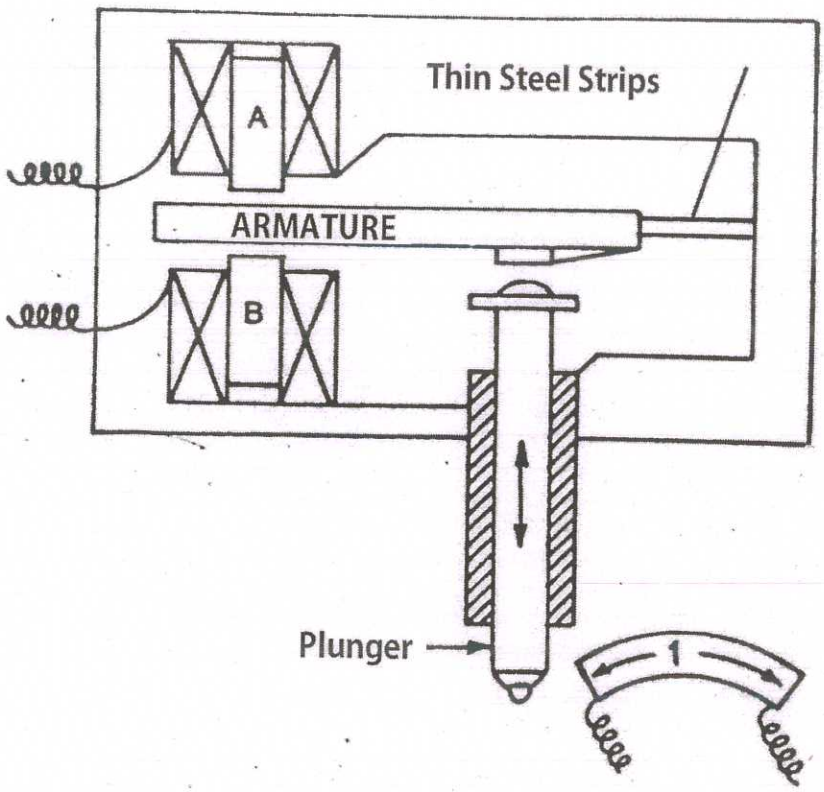

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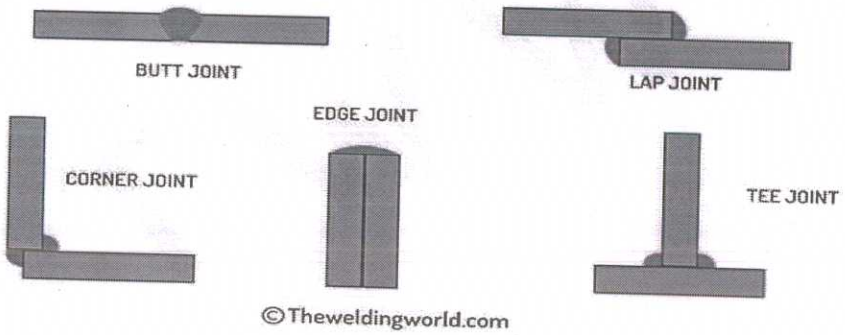
4

V(a)

TYPES OF WELDING JOINTS



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Tee Joint
Tee welding joints are formed when two members intersect at a 90° angle which makes the edges come together in the centre of a plate or component. Tee Joints are considered a type of fillet weld, and can also be made when a pipe or tube is welded onto a base plate. Extra care is required to ensure effective penetration into the roof of the weld.

8

Lap Joint
Lap welding joints are used most often to joint two pieces with differing thicknesses together. Also considered a fillet type, the weld can be made on one or both sides. A Lap Joint is formed when 2 pieces are placed in an over lapping pattern on top of each other.

Edge Joint
Edge welding Joints are often applied to sheet metal parts that have flanging edges or are placed at a location where a weld must be made to attach to adjacent pieces. Being a groove type weld, Edge Joints, the pieces are set side by side and welded on the same edge. For heavier applications filler metal is added to melt or fuse the edge completely and to reinforce the plate.

4

Corner Joint
Being one of the most popular welds in the sheet metal industry the Corner welding joint is used on the outer edge of the piece. This weld is a type of joint that comes together at right angles between two metal parts to form an L. These are common in the construction of boxes, box frames and similar fabrications.

Butt Joint
Being the universally accepted method for attaching a pipe to itself it's also used for valves, flanges, fittings, and other equipment. A butt welding joint is also known as a square grove weld. It's the easiest and probably the most common weld there is. It consists of two flat pieces that are side by side parallel. It's a very affordable option.

V(b)

- Weld Crack.
- Undercut
- Spatter
- Porosity
- Overlap
- Crater
- Slag Inclusion
- Incomplete Fusion. (Any Seven)

7x1

7

VI(a)

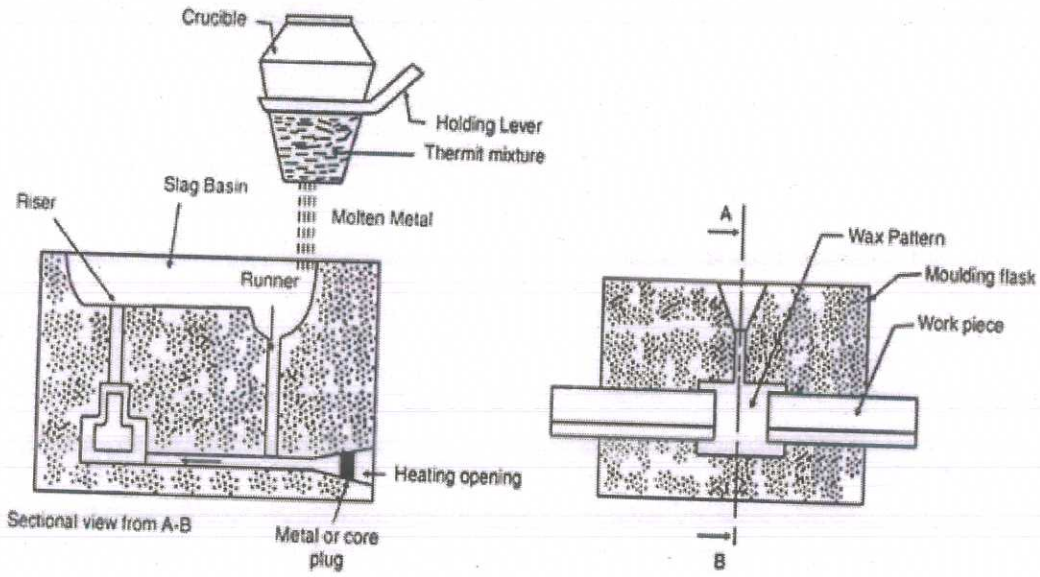

Fig. 7.40. Thermit welding.

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Thermit Welding is a **welding** process utilizing heat generated by exothermic chemical reaction between the components of the **thermit** (a mixture of a metal oxide and aluminium powder). The molten metal, produced by the reaction, acts as a filler material joining the work pieces after Solidification.

4

VI(b)

Welding	Brazing	Soldering
Base metal fused	Base metal doesn't fused	Base metal doesn't fused
High Temp , High power	Low Temp , Low power	Low Temp , Low power
High distortion	Low distortion	No distortion
High stresses in joints	Low stresses in joints	Low stresses in joints
Mictrostucture of base metal change	Base Metal Microstructure no change	Base Metal Microstructure no change
Dissimilar metals difficult to join	Dissimilar metal easy to join	Dissimilar metal easy to join
Thin sheet difficult to weld	Thin sheet can be joined	Thin sheet can be joined
High strength of joints	Low strength of joints	Low strength of joints
Tensile strength > 200 MPa	Tensile strength 100~150 Mpa	Tensile strength <75MPa

7

7

VII(a) A perfect crystal, with every atom of the same type in the correct position, does not exist. All crystals have some defects. Defects contribute to the mechanical properties of metals. In fact, using the term "defect" is sort of a misnomer since these features are commonly intentionally used to manipulate the mechanical properties of a material. Adding alloying elements to a metal is one way of introducing a crystal defect. Nevertheless, the term "defect" will be used, just keep in mind that crystalline defects are not always bad. There are basic classes of crystal defects:

4

- **point defects**, which are places where an atom is missing or irregularly placed in the lattice structure. Point defects include lattice vacancies, self-interstitial atoms, substitution impurity atoms, and interstitial impurity atoms
- **linear defects**, which are groups of atoms in irregular positions. Linear defects are commonly called dislocations.
- **planar defects**, which are interfaces between homogeneous regions of the material. Planar defects include grain boundaries, stacking faults and external surfaces.

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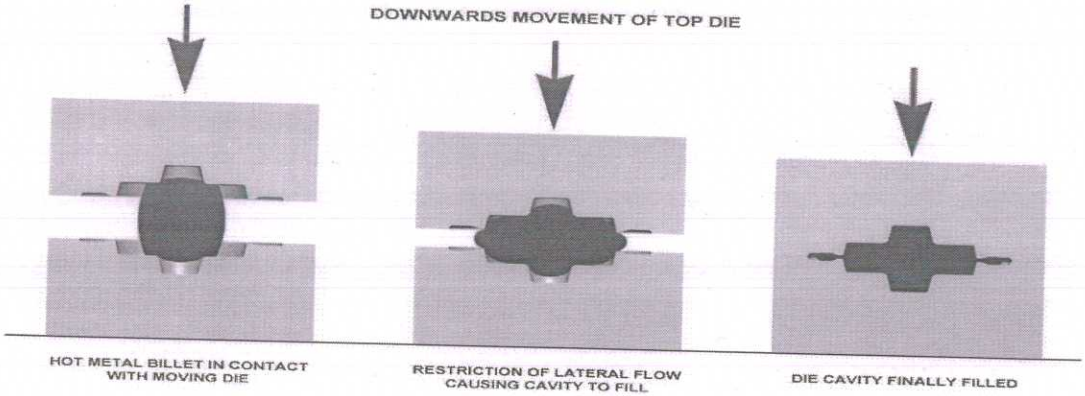
VII(b)



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8

Closed Die Forging is a **forging** process in which **dies** move towards each other and covers the workpiece in whole or in part. The heated raw material, which is approximately the shape or size of the final **forged** part, is placed in the bottom **die**

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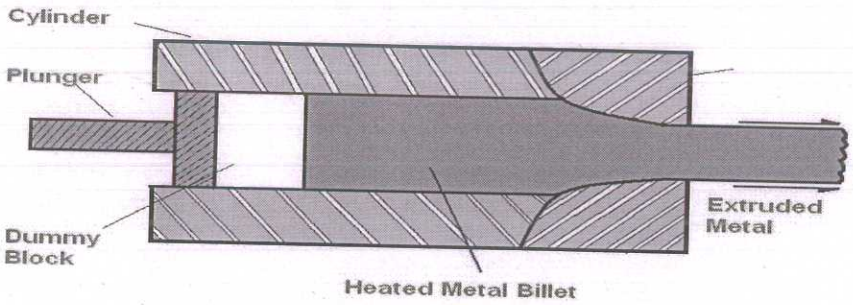
VIII(a)

Direct Or Forward Extrusion Process



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Direct extrusion, also called as forward **extrusion**, is a type of **extrusion** that occurs when the direction of flow of metal is the same that movement of ram. A s can be seen in the following figure: Many cross sections are manufactured by this method.

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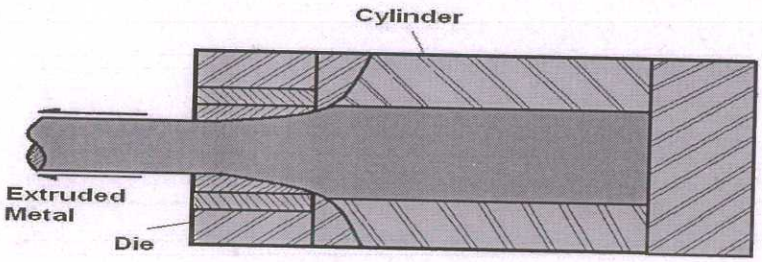

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Backward Or Indirect Extrusion Process

Indirect Extrusion is a method in which the Ram is stationary and the dye moves forcing the Billet through the dye. So as to keep the die stationary a stem is used which should be longer than the container containing the Billet.

VIII(b)

Comparison of Hot and Cold Working

S.No	Hot Working	Cold Working
1	Working above recrystallization temperature	Working below recrystallization temperature
2	Formation of new crystals	No crystal formation
3	Surface finish not good	Good surface finish
4	No stress formation	Internal Stress formation
5	No size limit	Limited size

8 8

IX(a)

Types of Pattern Allowances

1. Shrinkage or Contraction Allowance
2. Draft Allowance
3. Finishing or Machining Allowance
4. Distortion or Camber Allowance
5. Rapping or Shaking Allowance

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Shrinkage or Contraction Allowance

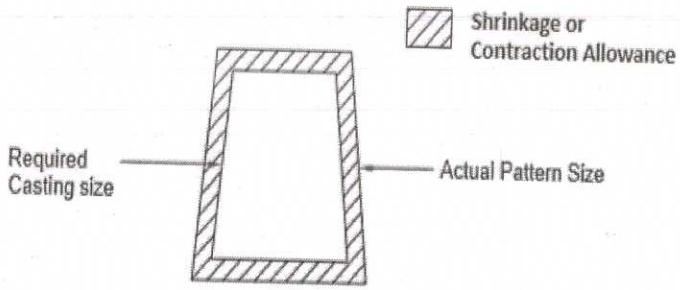

Figure. Shrinkage or contraction Allowance

When any metal cools from liquid to solid state, it naturally shrinks in size. If the actual object is used for the pattern, resulting casting size would be slightly smaller than desired size. To overcome this shrinkage problem, shrinkage allowance is considered while designing a pattern and due to this pattern is slightly larger than casting

Draft Allowance

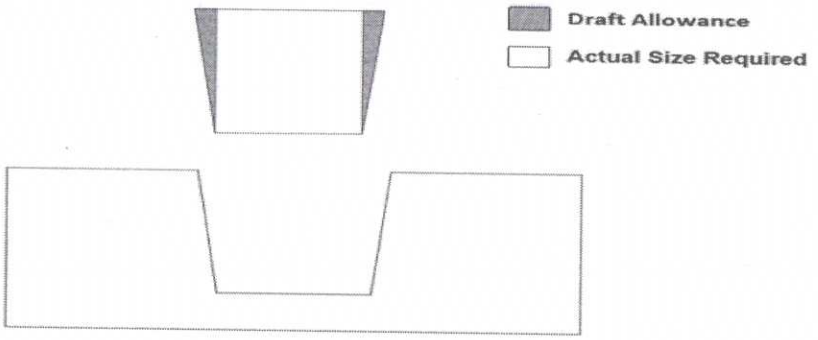

Figure. Draft Allowance

When a pattern is drawn out from a mould, then the surface of mould in contact with pattern is damages, if the surface is parallel to the direction at which pattern withdrawn. To avoid this, taper is given to this surface. This tapering of the sides of pattern is known as draft. This allows easy removal of pattern from mould. The amount of draft is required, depends upon the shape and size of casting, moulding method, complexity of pattern.

Finishing or Machining Allowance

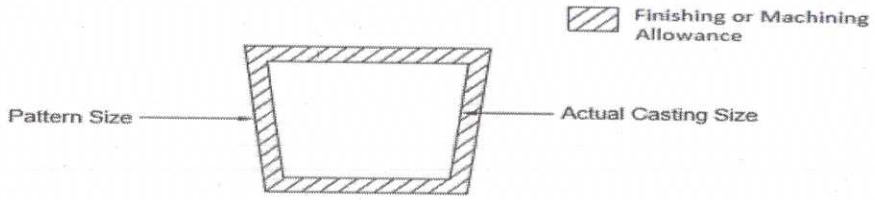

Figure. Finishing or Machining Allowance

Casting is not a final or finish product. To convert casting into finish product, casting is going through some machining or finishing operations. In machining operation some amount of material is removed from casting, this factor is considered while designing a pattern and pattern is design slightly larger than required dimensions this is known as finishing allowance or machining allowance.

Distortion or Camber Allowance

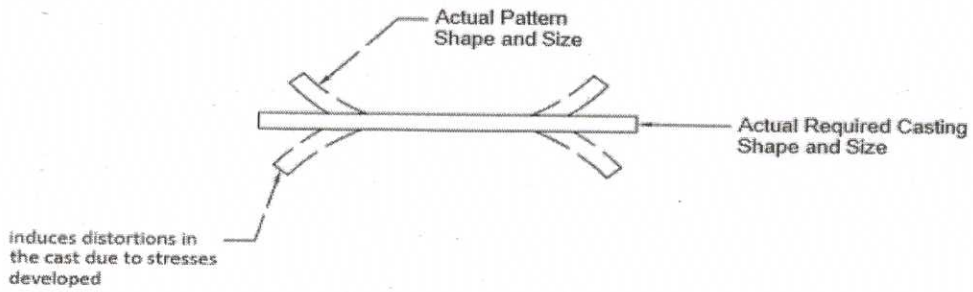

Figure. Distortion or Camber Allowance

During cooling of the casting, stresses developed in the solid metal which induces distortions in the cast, If the casting is thinner in width as compared to its length and having irregular shapes such as U shape, T shape or those who having large flat areas. This can be avoided by initially distorting the pattern in the opposite direction. This change in casting dimension is known as distortion or camber allowance. Distortion allowance is given to the pattern by judgment and experience of pattern maker.

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Rapping or Shaking Allowance

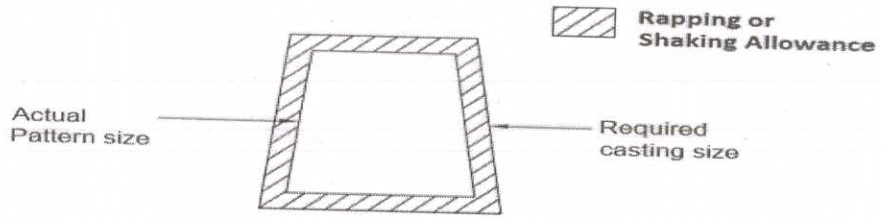

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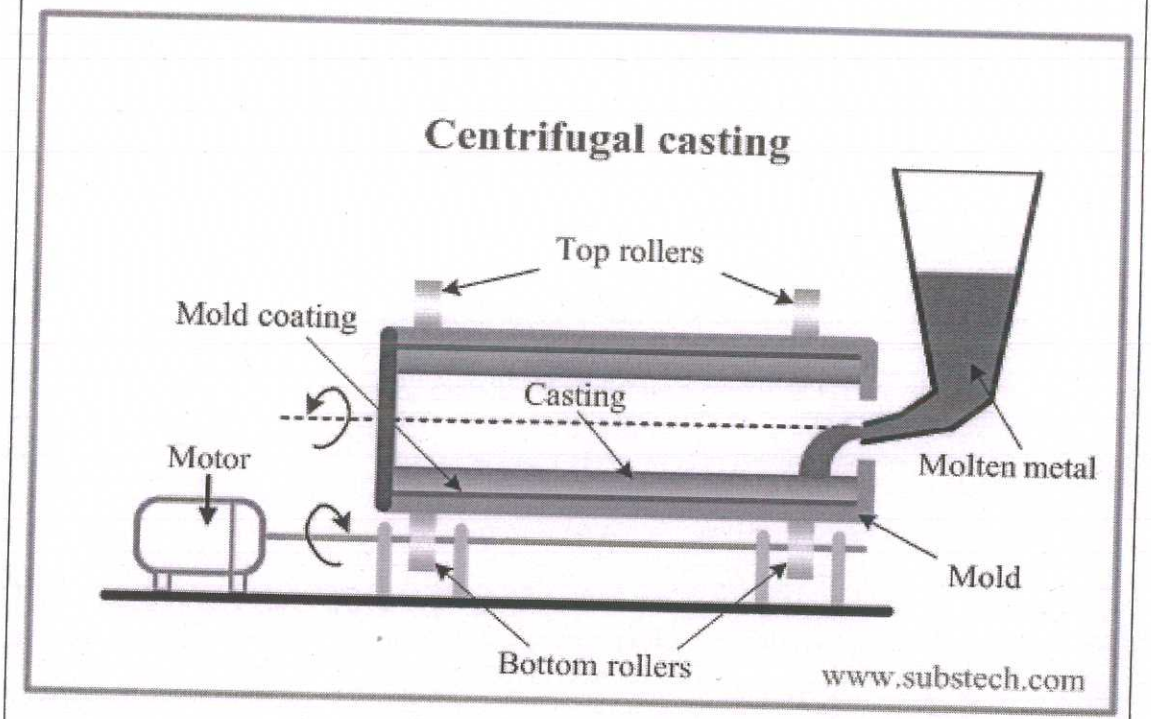
Figure. Rapping or Shaking Allowance

A pattern is rapped all around the faces, during removal of the pattern from the mould cavity, to remove pattern easily. Due to this, cavity in the mould is slightly increased. It is ignored while casting having an average size but in large casting size and when casting is required of precise size then rapping or shaking allowance is consider by making a pattern slightly smaller.

IX(b)



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Centrifugal casting or rotocasting is a **casting** technique that is typically used to cast thin-walled cylinders. It is typically used to cast materials such as metals, glass, and concrete. A high quality is attainable by control of metallurgy and crystal structure

3

X(a)

Thermoplastics	Thermosetting Plastics
They change their shape upon heating and cooling.	Once formed they do not undergo shape conversion upon heating and cooling
Expensive	Cheap
Recyclable	Not recyclable
The best example is polythene which changes its shape upon heating and cooling.	The best example is the Bakelite which once formed does not change its shape upon further heating.

8 8

X(b) 1. Hand riddle 2. Shovel 3. Rammers 4. Sprue pin 5. Strike off bar 6. Mallet 7. Draw spike 8. Vent rod 9. Lifters 10. Trowels 11. Slicks 12. Smoothers 13. Swab 14. Spirit level 15. Gate cutter 16. Gaggers 17. Bellows 18. Clamps, cotters and wedges

(Any seven)

7×1 7