WINTER-16 EXAMINATION

Model Answer Subject Code **17456**

WINTER – 16 EXAMINATIONS

Subject Code: **17456** **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 judgment on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

WINTER-16 EXAMINATION

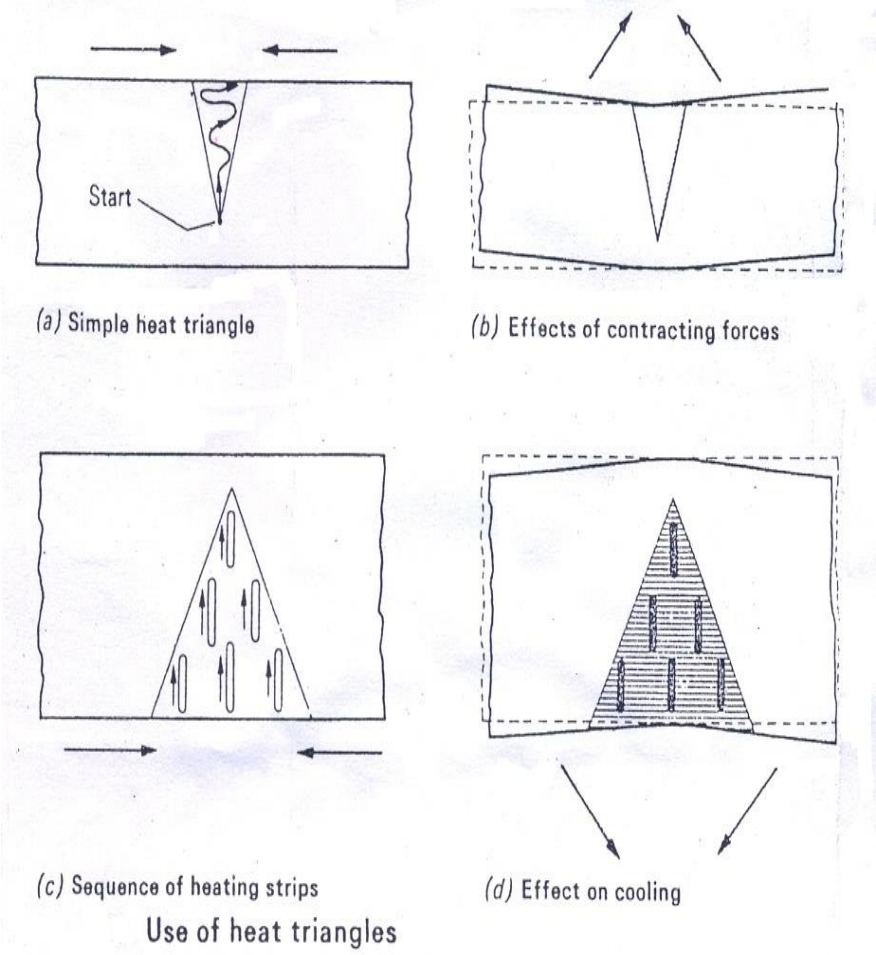
Model Answer Subject Code **17456**

Q. NO.	MODEL ANSWER	MARKS	TOTAL
1.	**Attempt any five of the following**	**5*4**	**20**
a)	**Classification of methods of measurement:** Depending upon the accuracy required and the amount of permissible error, the following methods of measurement are followed. • **Direct method of measurement.** In this method the value of a quantity is obtained directly by comparing the unknown with the standard. It involves, no mathematical calculations to arrive at the results. For example, measurement of length by a graduated scale. The method is not very accurate because it depends on human insensitiveness in making judgement. • **Indirect method of measurement.** In this method several parameters (to which the quantity to be measured is linked with) are measured directly and then the value is determined by mathematical relationship. For example, measurement of density by measuring mass and geometrical dimensions. • **Fundamental method of measurement**. Also known as the absolute method of measurement, it is based on the measurement of the base quantities used to define the quantity. For example, measuring a quantity directly in accordance with the definition of that quantity, or measuring a quantity indirectly by direct measurement of the quantities linked with the definition of the quantity to be measured. • **Comparison method of measurement**. This method involves comparison with either a known value of the same quantity or another quantity which is function of the quantity to be measured. • **Substitution method of measurement.** In this method, the quantity to be measured is measured by direct comparison on an indicating device by replacing the measuring quantity with some other known quantity which produces same effect on the indicating device. For example, determination of mass by Borda method. • **Transposition method of measurement.** This is a method of measurement by direct comparison in which the value of the quantity to be measured is first balanced by an initial known value A of the same quantity ; next the value of the quantity to be measured is put in the place of that known value and is balanced again by a second known value B.	4m (any 4)	**04**

	When the balance indicating device gives the same indication in both cases, the value of the quantity to be measured is VAB. For example, determination of a mass by means of a balance and known weights, using the Gauss double weighing method. • **Differential or comparison method of measurement**. This method involves measuring the difference between the given quantity and a known master of near about the same value. For example, determination of diameter with master cylinder on a comparator. • **Coincidence method of measurement**. In this differential method of measurement the very small difference between the given quantity and the reference is determined by the observation of the coincidence of scale marks. For example, measurement on vernier calipers. • **Null method of measurement.** In this method the quantity to be measured is compared with a known source and the difference between these two is made zero. • **Deflection method of measurement.** In this method, the value of the quantity is directly indicated by deflection of a pointer on a calibrated scale. • **Interpolation method of measurement.** In this method, the given quantity is compared with two or more known value of near about same value ensuring at least one smaller and one bigger than the quantity to be measured and the readings interpolated. • **Extrapolation method of measurement**. In this method, the given quantity is compared with two or more known smaller values and extrapolating the reading. • **Complimentary method of measurement.** This is the method of measurement by comparison in which the value of the quantity to be measured is combined with a known value of the same quantity so adjusted that the sum of these two values is equal to predetermined comparison value. For example, determination of the volume of a solid by liquid displacement. • **Composite method of measurement**. It involves the comparison of the actual contour of a component to be checked with its contours in maximum and minimum tolerable limits. This method provides for the checking of the cumulative errors of the interconnected elements of the component which are controlled through a combined tolerance. This method is most reliable to ensure inter-changeability and is usually effected through the use of composite "Go" gauges, for example, checking of the thread of a nut with a screw plug "GO" gauge.		

	• **Element method.** In this method, the several related dimensions are gauged individually, i.e. each component element is checked separately. For example, in the case of thread, the pitch diameter, pitch, and flank angle are checked separately and then the virtual pitch diameter is calculated. It may be noted that value of virtual pitch diameter depends on the deviations of the above thread elements. The functioning of thread depends on virtual pitch diameter lying within the specified tolerable limits. In case of composite method, all the three elements need not be checked separately and is thus useful for checking the product parts. Element method is used for checking tools and for detecting the causes of rejects in the product. • **Contact and contactless methods of measurements.** In contact methods of measurements, the measuring tip of the instrument actually touches the surface to be measured. In such cases, arrangements for constant contact pressure should be provided in order to prevent errors due to excess contact pressure. In contactless method of measurements, no contact is required. Such instruments include tool-maker's microscope and projection comparator, etc.		
b)		4m (ANY 4 POINTS)	**04**

SR NO	ACCURACY	PRECISION
1	Accuracy refers to the closeness of a measured value to a standard or known value.	Precision refers to the closeness of two or more measurements to each other.
2	eg. In a lab a voltmeter which is used to measure 50 Volts if it measures 50 volts it is accurate.	eg. In a lab the same instruments used to take 3 readings and if it measures 50 volts repeatedly then it is precise.
3	It is concerned with a single process.	it is concerned with a set of process.
4	An accurate instrument always gives correct reading.	A precise instrument always not give correct reading , it means it may repeat the wrong reading again.

c)		2m (dia) 2m	**4M**

Use of heat triangles:

The use of heat triangles for straightening thin angle and flat sections, and the use of 'triangles' of heat strips for the bending and straightening of plate and wide sections are as shown in the figures below.

Simple heat triangles may be used as shown in figure a) below by starting with the heating torch at the apex of the triangle and working towards the base with a gradually widening zigzag movement. When allowed to cool, the base of the heat triangle will start to contract the most, and the contracting forces tend to cause the plate to bend, as shown in figure b) below.

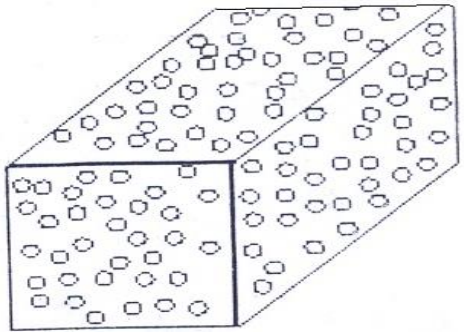
The resultant effects of using triangles of heat strips are exactly the same as for the simple heat triangles. Simple heat triangles are used for straightening of thin plate and light sections. Triangles of heat strips are preferred when bending or straightening thick plate and heavy sections.

The order, in which the heat strips are applied, in the triangle, is shown

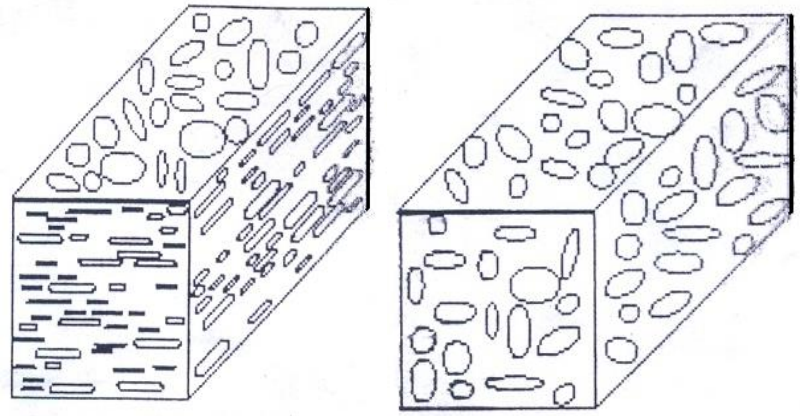
	below in figure c). Heating with the torch is commenced a short distance in from the edge of the plate, progressively heating from the outside inwards.		
d)	**Reasons for stiffening:** The main reasons for stiffening sheet metal are; • To give strength and rigidity to the material. • To produce a safe edge. • For decorative purpose • To reinforce the section to carry more load • Sometimes to reduce wind resistance.	4m (ANY 4)	**04**
e)	A typical composite material is a system of materials composing of two or more materials (mixed and bonded) on a macroscopic scale. Generally, a composite material is composed of reinforcements (fibres, particles, flakes and/or fillers, additives) embedded in a matrix (polymer/resins, metals or ceramics). The matrix holds the reinforcement to form the desired shape while the reinforcement improves the overall mech. properties of the matrix. **Classification of composites:** <u>Based on matrix material</u> 1)Metal Matrix Composites (MMC): Metal Matrix Composites are composed of a metallic matrix (aluminum, magnesium, iron, cobalt, copper) and a dispersed ceramic (oxides, carbides) or metallic (lead, tungsten, molybdenum) phase. 2) Ceramic Matrix Composites (CMC): Ceramic Matrix Composites are composed of a ceramic matrix and embedded fibers of other ceramic material (dispersed phase). 3) Polymer Matrix Composites (PMC): Polymer Matrix Composites are composed of a matrix from thermoset (Unsaturated Polyester (UP), Epoxy (EP)) or thermoplastic (Polycarbonate (PC), Polyvinylchloride, Nylon, Polystyrene) and embedded glass, carbon, steel or Kevlar fibers (dispersed phase). **OR** <u>Based on reinforcing material structure</u> 1)Particulate Composites Particulate Composites consist of a matrix reinforced by a dispersed phase	2 m (DEFINATION) 2m (any 2)	**04**

in form of particles.

1. Composites with random orientation of particles.

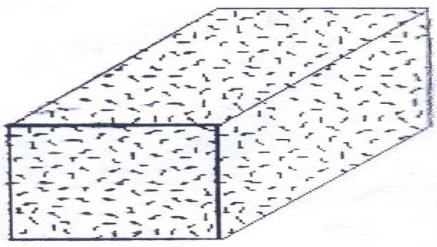


2. Composites with preferred orientation of particles. Dispersed phase of these materials consists of two-dimensional flat platelets (flakes), laid parallel to each other.

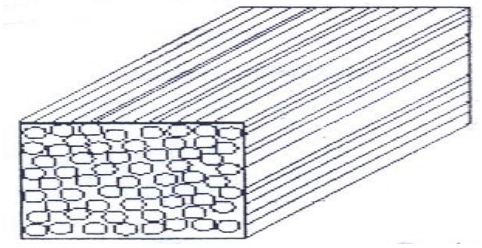


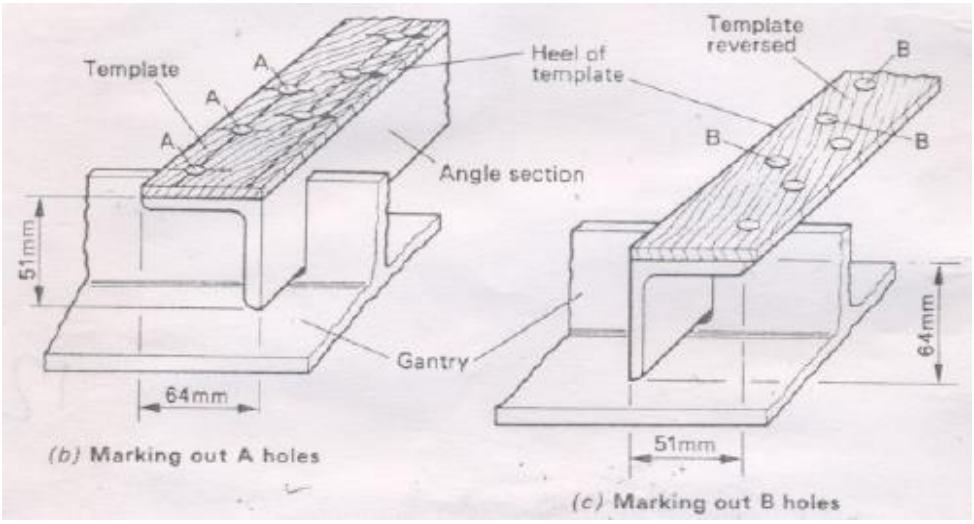
2)Fibrous Composites

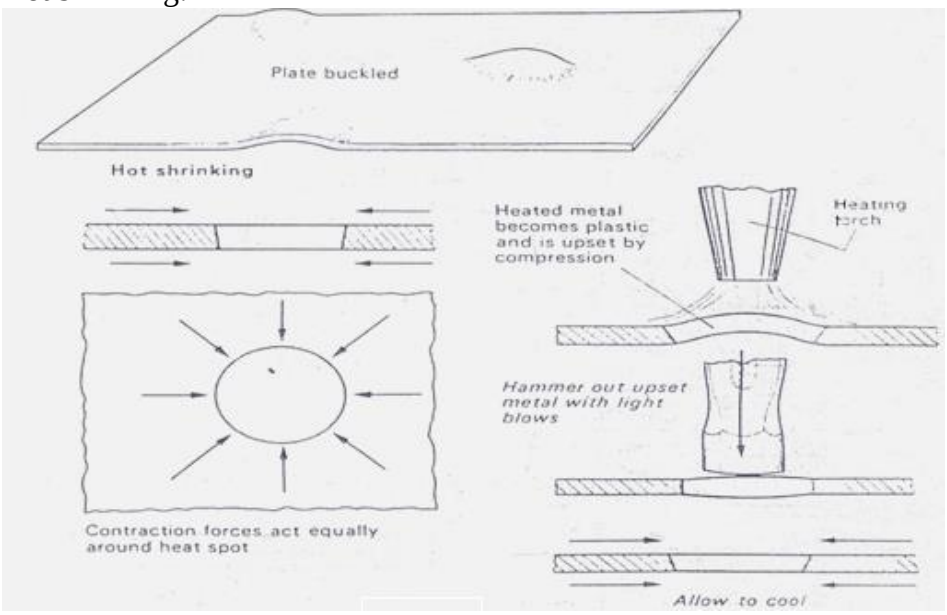
1. Short-fiber reinforced composites. Short-fiber reinforced composites consist of a matrix reinforced by a dispersed phase in form of discontinuous fibers (length < 100*diameter).
    1. Composites with random orientation of fibers.
    2. Composites with preferred orientation of fibers.

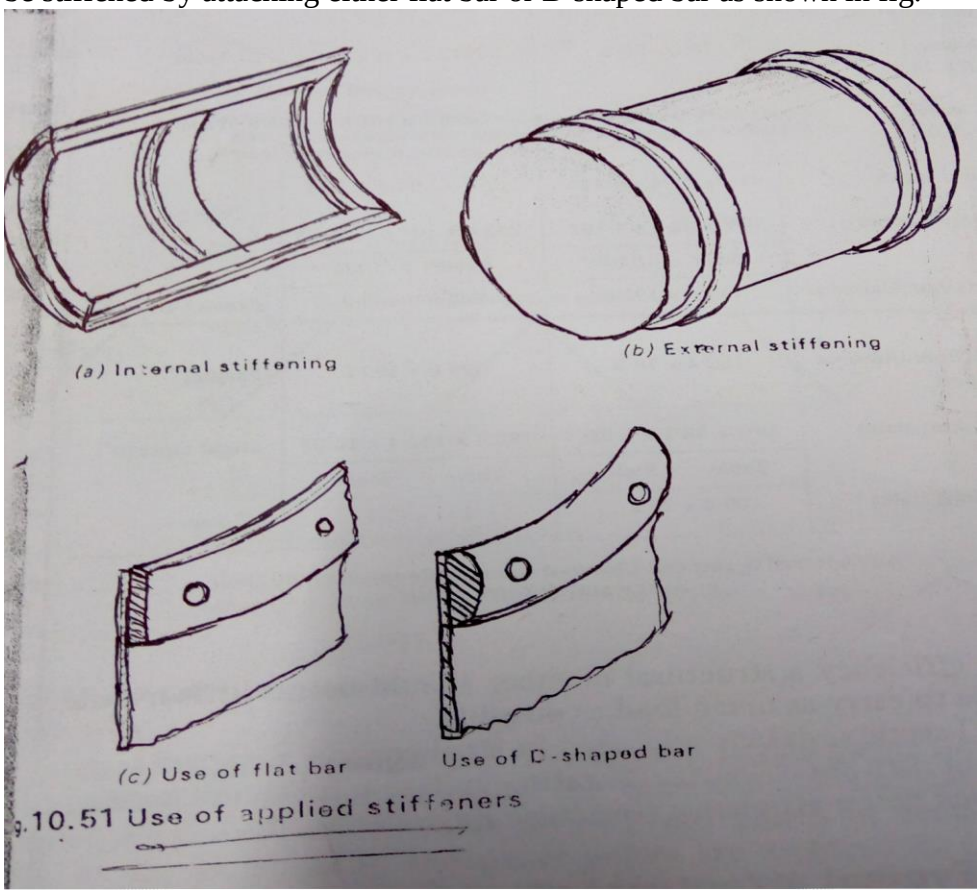


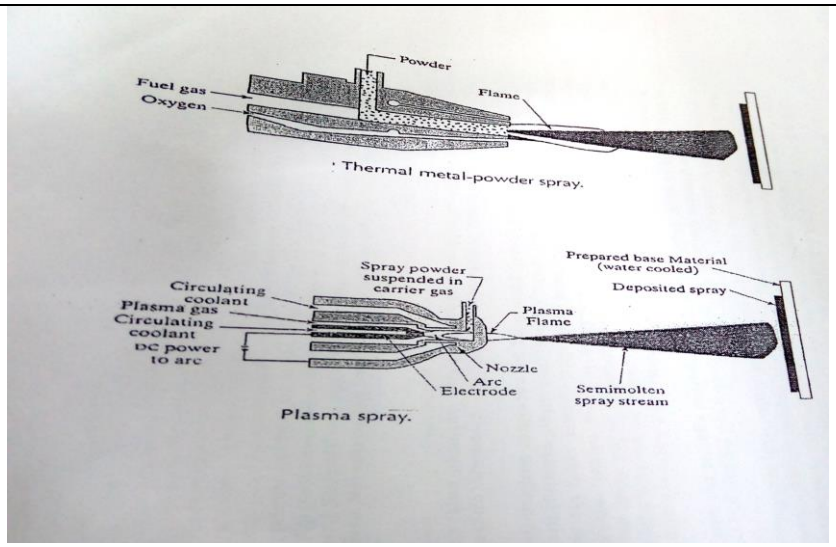
2. Long-fiber reinforced composites. Long-fiber reinforced composites

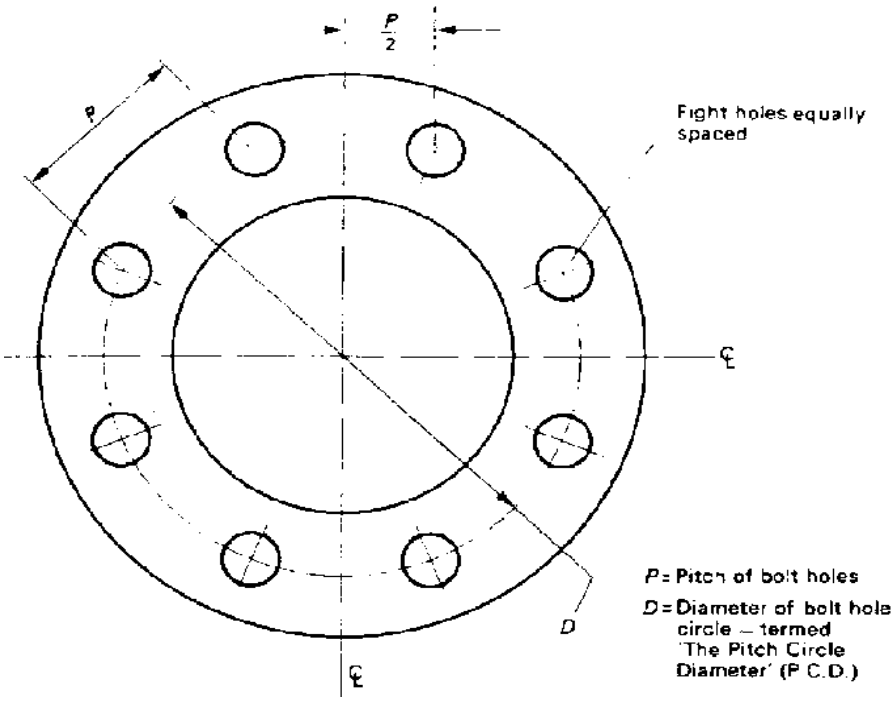
	consist of a matrix reinforced by a dispersed phase in form of continuous fibers. 1. Unidirectional orientation of fibers. 2. Bidirectional orientation of fibers (woven).  3)Laminate Composites When a fiber reinforced composite consists of several layers with different fiber orientations, it is called multilayer (angle-ply) composite.		
f)	**Need for surface coating:** Some of the properties of engineering components sharply depend on the surface quality of the components. The properties largely affected by surface quality and type of surface are: Corrosion resistance, wear resistance, abrasion resistance, reflectivity, hardness, conductivity, etc. To achieve these properties, many times the surface of a component is coated or covered with another material, which changes the physical, mechanical and electrical properties of the component. The material at the surface provides a physical barrier between the environment and the surface of the component. **Need for surface cleaning:** The need to provide the above mentioned physical barrier for a long period of time, such materials should have inherently certain desired properties, be continuous and uniform in thickness. These requirements are fulfilled only if there exist an excellent adhesion between the surface and the coated layer. Pre-treatment is therefore the preparation of the substrate surface, by chemical and / or physical means, so that it becomes optimized to accept the powder coating finish. To do so, it is essential to ensure that the substrate is free of dirt, grease, oil and metal oxides, such as rust and mill scale.	02 marks 02 marks	**04**
g)	**Importance of plant layout:** An efficient factory layout is one that can be instrumental in achieving the following objectives; a) Proper and efficient utilization of available floor space b) To ensure that work proceeds from one point to another point without	04 Marks (any4)	**04**

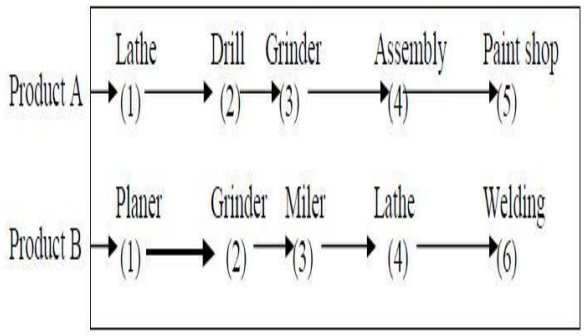
	any delay c) Provide enough production capacity d) Reduce material handling cost e) Reduce hazards to personnel f) Utilize labor efficiently g) Increase employee morale h) Reduce accidents i) Provide for volume and product flexibility j) Provide ease of supervision and control k) Provide for employee safety and health l) Allow ease of maintenance m) Allow high machine or equipment utilization n) Improve productivity		
h)	**Marking off holes in angle sections:**  	04 m diagram	**4M**
2.	**Attempt any FOUR of the following**	**4*4**	**16**
a)	**Tools used in marking:-** 1. Surface Plate: - It provides perfectly flat i.e. true surface. 2. Angle Plate: - It assists in holding the work piece perpendicular to the table. 3. Scriber: - It is equivalent to pen or pencil. It literally scratches the metal surface living behind fine bright line. 4. Height Gauge: - Allow line to be scribed at a pre-set distance from	04 m (any 4)	**04**

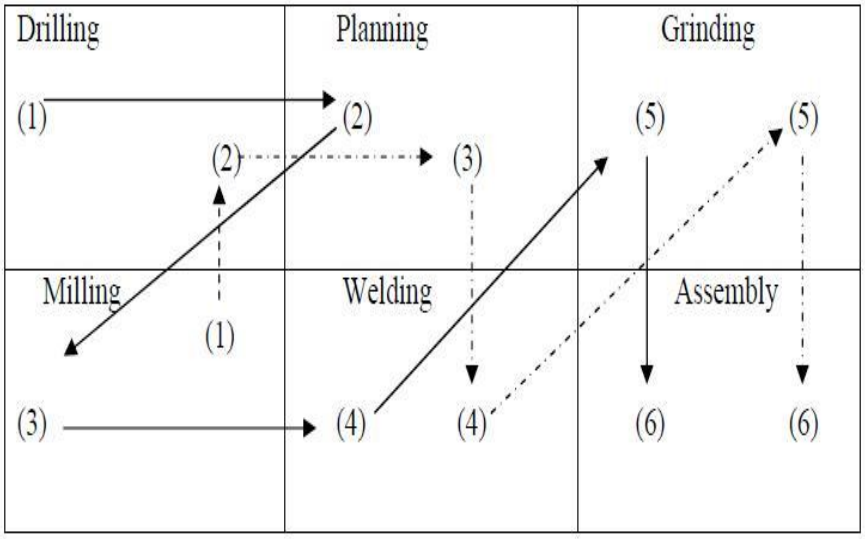
	the datum surface. 5. Tri Square: - To transfer 90 ^{0} angle to the work piece. 6. Steel Tape: - It is used for linear measurement. 7. Protractor: - It is used for measuring angle. 8. Punch: - Used to create permanent mark. 9. Ball Peen hammer: - It is used in conjunction with the punch to provide the striking blow required. 10. Divider or Compass: - It is used for drawing out circles or arc of any desired radius.		
b)	Hot shrinking:  It has been known that the application of heat can produce distortion. Heat can be used to advantage, for those same forces of expansion and contraction can be harnessed to remove distortion in plates or to straighten sections. The figures below illustrate the principle of shrinking a thin plate at the places that are stretched. A buckled or deformed plate may be straightened by the relatively simple process of 'hot shrinking'. A number of spots in the area of stretched (buckled) metal are heated to a cherry-red (approximately 750°C) and allowed to cool in turn. The metal which is locally heated becomes plastic,	02 m (DIA) 2M	**4M**

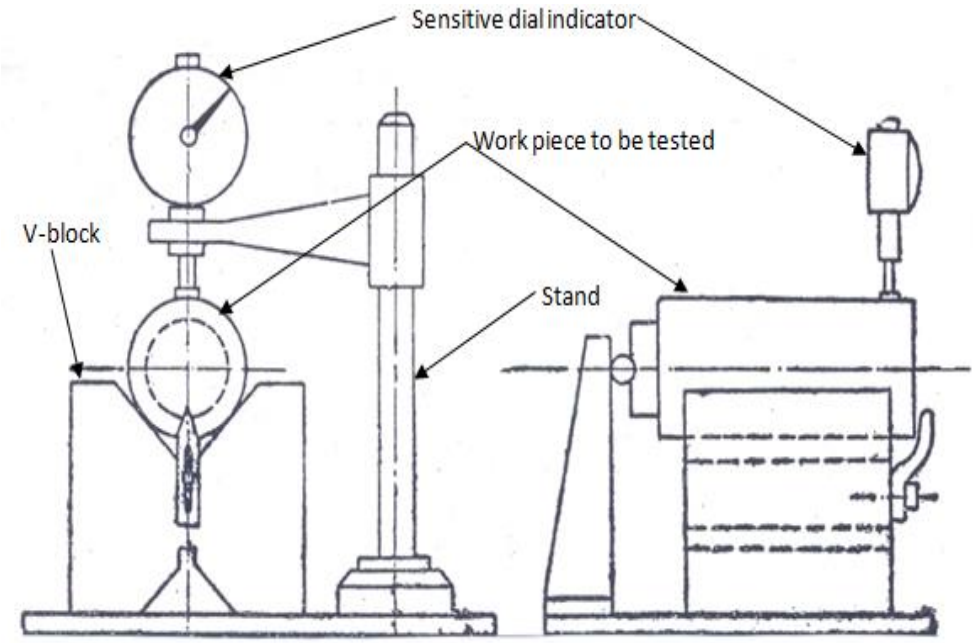
	but the surrounding cold metal plate prevents thermal expansion. The plastic area becomes upset by compressive forces. When a heated spot is allowed to cool, the metal will tend to contract, and it is during this shrinkage that contractional stresses will occur. The process is repeated until the stretched areas of metal are compressed and the plate is restored to a straight and flat condition. This process is widely used in Light Vehicle Crash Repair And Panel-Beating Workshops.		
c)	**Description:** Fig illustrates an application of internal stiffening of a panel of circular shapes. The stiffening sections in this case rolled to correct contour and attached externally. When a sheet metal is too thick to allow the edge to be wired the edges may be stiffened by attaching either flat bar or D shaped bar as shown in fig.  	02 m 2m (dia)	**4m**
d)	**Following are the applications of composites:-** 1)AEROSPACE APPLICATIONS:- One of the primary requirements of aerospace structural materials is that	4m (any 4)	**4M**

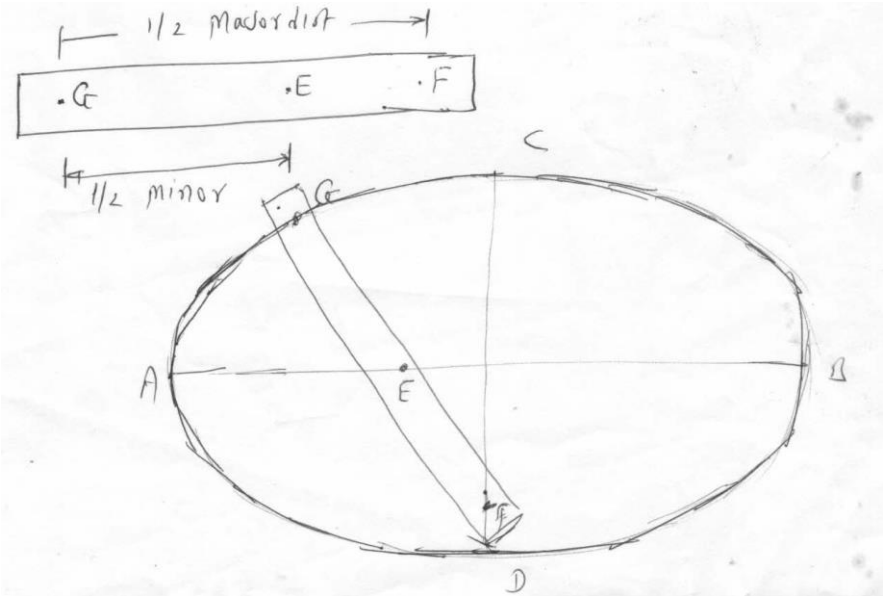
	they should have low density and, at the same time, should be very stiff and strong. 2) Automotive Engineering Feasibility studies were carried out, since early seventies, to explore the possibilities of using composites in the exterior body panels, frameworks/chassis, bumpers, drive shafts, suspension systems, wheels, steering wheel columns and instrument panels of automotive vehicles. 1) Civil Engineering:- Composite materials are most popularly used in civil engineering applications for construction like RCC. 2) Marine Applications:- Strong, stiff and light composites are also very attractive materials for marine applications. GFRPs are being used for the last 3-4 decades to build canoes, yachts, speed boats and other workboats. 3) Composites also have extensive uses in electrical and electronic systems. 4) Composites are, now-a-days, preferred to other materials in fabrication of several important sports accessories		
e)		2m (dia)	**4M**

	Working:- In this method a metallic or nonmetallic material in the form of wire or powder is fed into heat source which melts the material and sprays it on to the surface of the work piece. The work piece does not melt like it does in hard facing. May be used to improve corrosion resistance, thermal resistance, wear resistance because both metal and ceramic based coatings may be applied. Generally the work piece needs to be roughened up before spraying to help with adhesion of sprayed material.	2m	
f)	Dynamics of plant layout: Plant layout is a dynamic rather than a static concept meaning thereby if once done if is not permanent in nature rather improvement or revision in the existing plant layout must be made by keeping a track with development of new machines or equipment, improvements in manufacturing process, changes in materials handling devices etc. But any revision in layout must be made only when the savings resulting from revision exceed the costs involved in such revision.	4m	**4M**
3.	**Attempt any <u>TWO</u> of the following**	**8X2**	**16**
a)	Dia:-  	04m (dia)	**08**

	Description:- • Many fabrication such as boilers, chemical plant, pressure vessels incorporate the use of flanged inlet & outlet, pipes of various diameters are connected by means of flange. • The flanges are welded and connections are made by bolting. • Fig shows a flange with 8 holes lies on circle which is known as pitch circle. • Note that bolt holes never lie on the vertical center line because there is more chance of failure of the lowest bolt. • The distance between adjacent holes is referred as pitch. If 8 holes are to be drilled on a pitch circle of 406 mm then pitch of adjacent holes may be calculated as follows:- • The pitch distance of adjacent holes= PCD X constant for 8 holes • To obtain the position of first hole divide pitch by 2 set the divider to these dimension and mark off from intersection of vertical center line and bolt circle. • The reminder of the bolt hole center may now be located with the divider et as correct pitch.	04m	
b)	THERE ARE THREE TYPES OF LAYOUT:- 1) PRODUCT LAYOUT 2) PROCESS LAYOUT 3) FIXED LAYOUT **Explanation of Any One Type:-** **1) PRODUCT LAYOUT:-**  	02 marks (any 2 name) 3m (dia)	**08**

	Under this, machines and equipments are arranged in one line depending upon the sequence of operation required for the product . The materials move form one workstation to another sequentially without any backtracking or deviation. Under this, machines are grouped in one sequence All the machine tools or other items of equipments must be placed at the point demanded by sequence of operations especially spare parts, tools, periodic maintenance, etc. There should no points where one line crosses another line. Inspection and supervision is easy. 2) PROCESS LAYOUT:-  Product A: —————— Product B: - - - - - - - - - - - - In this type of layout machines of similar type are arranged together at one place. e.g. Machines performing drilling operations are arranged in the drilling department, etc. The job/s move from one department to another without creating bottlenecks. Other machines tools or other items of equipments in each department must have periodic maintenance. The distance between departments should be as short as possible for avoiding long distance movement of materials The arrangement should be convenient for inspection and supervision	03 marks	

c)	Following are the methods: 1)Diametral method 2)Circumferential Confining gauge method 3) Rotating on centres 4) V-block method **V-Block Method:-** Dia:-  **Assessment using a V-block ---** The set up employed for assessing the circularity error (lobing) by using a V-block is shown in the figure below. i.e. the V-block is placed on a surface plate and the work to be checked is placed upon it. A sensitive dial indicator is firmly fixed in a stand and its feeler is made to rest against the surface of the work. The work is rotated to measure the rise and fall of the work piece. For determining the number of lobes on the work piece, the work piece is first tested in a 60° V-block and then in a 90° V-block. The number of lobes is then equal to the number of times the indicator pointer deflects during rotation of the work piece through 360°.	2m (naming) 3m (dia) 3m	**08**

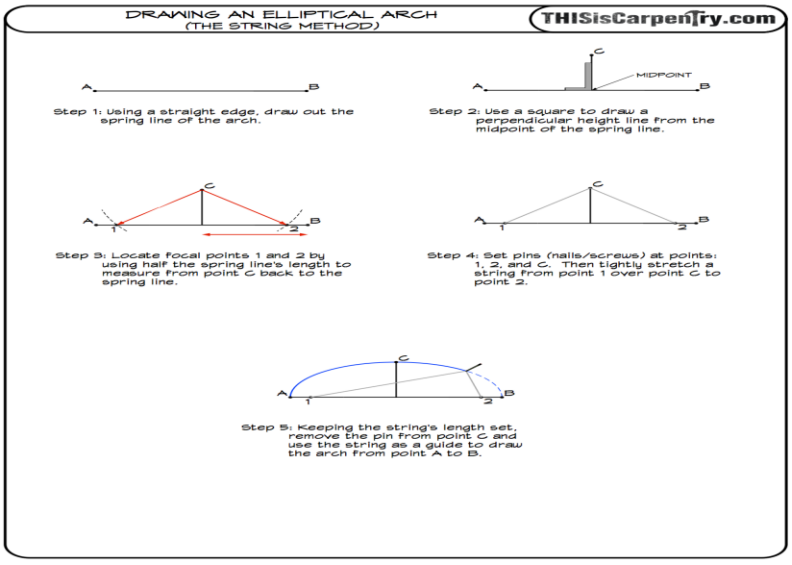
4.	Attempt any FOUR of the following	4*4	16
a)	**Template:-** Template is a piece of paper, sheet metal, wooden block which is used for marking process so as to avoid repetitive marking when marking is required to be done on several objects. **Need of templates:** There are several reasons for the use of templates on paltering the sheet metal and plate fabrication industries for e.g 1) To avoid repetitive marking of the same dimension where a no of identical parts or article are required. 2) To avoid unnecessary wastage of material. Very often when marking a large size plate from the information given on a drawing it is almost impossible to anticipate exactly where to begin in order that the complete layout can be economically accoodated. 3) To act as a guide for a cutting process. 4) As a simple means of checking bend angles and contours during for mining and rolling operation.	01 marks 3m (any3)	**04**
b)	**<u>Shop Method Of Drawing an Ellipse:-</u>** **1) By using an Elliptical trammel:-**  ➢ The trammel method of ellipse construction involves plotting a series of pointer by using a strip of paper, cardboard, plastic and rotating the strip up and down and around horizontal and vertical axes.	04m (any 1) (2m Dia & 2m descripti on)	**04**

- The stripes of length of paper or cardstock are a trammel.
- The trammel has 3marks, two representing the foci and one representing for ellipse circumference.
- Lay out horizontal (AB) and vertical (CD) axes that intersect at right angle.
- Determine the minor and major axes and the foci of the intended ellipse.
- On a strips or cardstock, lay off distance GE representing half the length of the minor axis and GF represents half the length of major axis.
- Set the trammel on the drawing so that E is always traversing AB an F is moving along CD
- AB we move the trammel plot points at G which will always indicate the circumference of the ellipse.

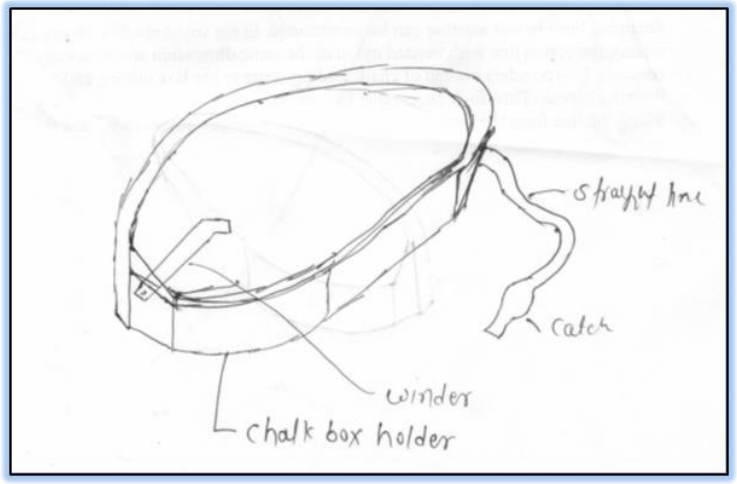
2) **Shop Method of drawing of an Ellipse:-**

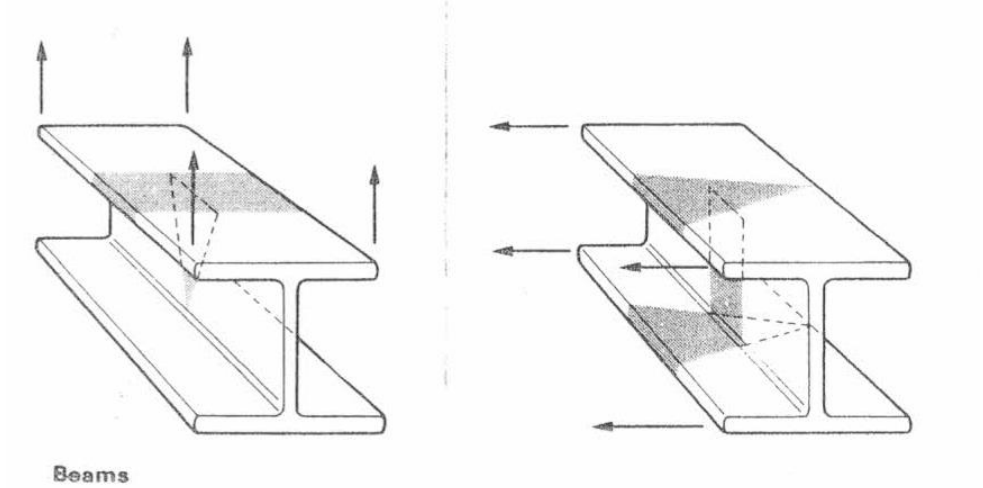
Fig shows the method of drawing an ellipse with the help of string; therefore it is called string method.

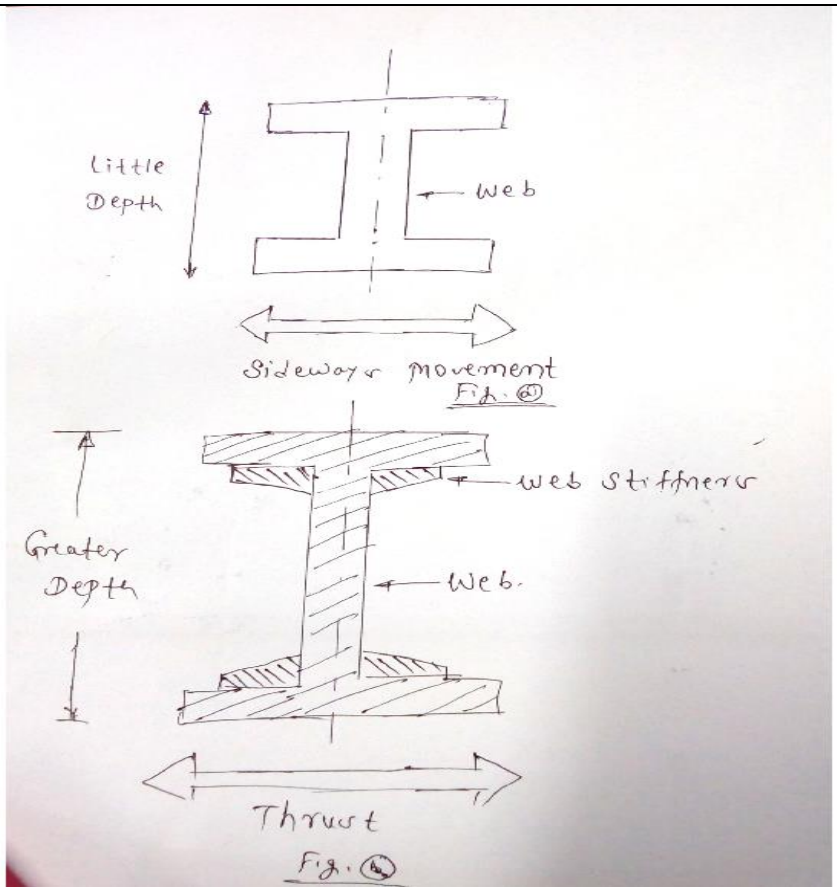
For this string method one should require Flat Square, measuring tape, string, nails, pins, pencil.

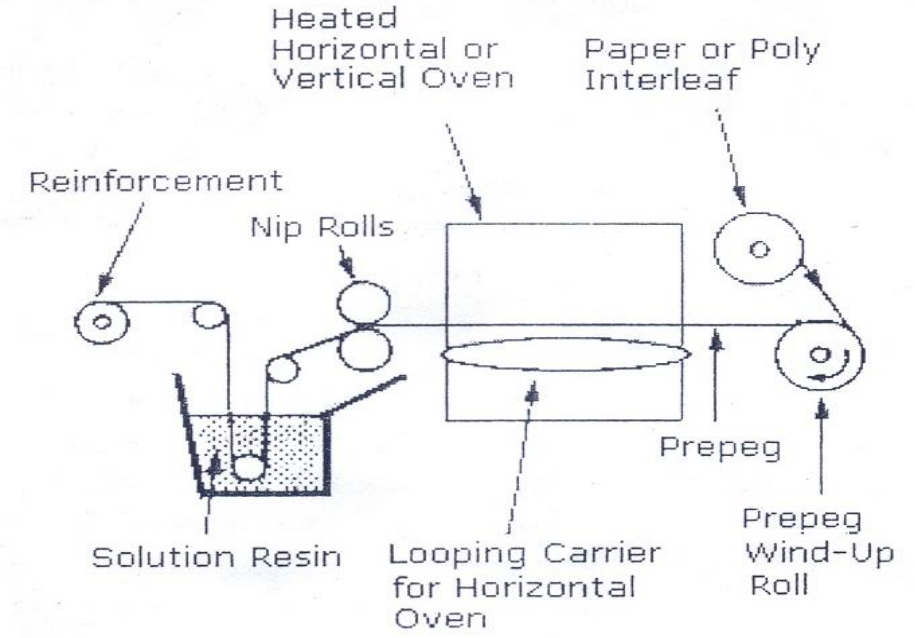


Using a straight edge draw the desired length of ellipse which is equals to

	major axis. Use a flat square to draw minor axis. It should be perpendicular to the major axis & pass through center point. Locate focal points 1& 2 by using half the length of major axis. Fix pins, nails, screws at point 1 & 2 and a pencil at point C, and then tightly stretch a string around the three points and ends together. Keeping string length constant operate the pencil from point C and use the string as guide to draw the ellipse.		
c)	**Use of Chalk line to mark a straight line:-**  **Description:-** A chalk line is used to mark a straight line over a longer distance. It consists of a holder with chalk and a long string wound up inside the holder. The holder is filled with chalk usually red oxide or marking chalk. Following are the steps used for marking:- 1) Coat the string with chalk by shaking the holder. 2) Then work with assistant & stretch the string across the wall, floor, piece of wood or surface you are marking. 3) If we don't have partner one can hook up the string on the surface using the catch. 4) The line is now hooked tightly from starting position over the length to be marked.	02 M (Dia) 2M	**04**

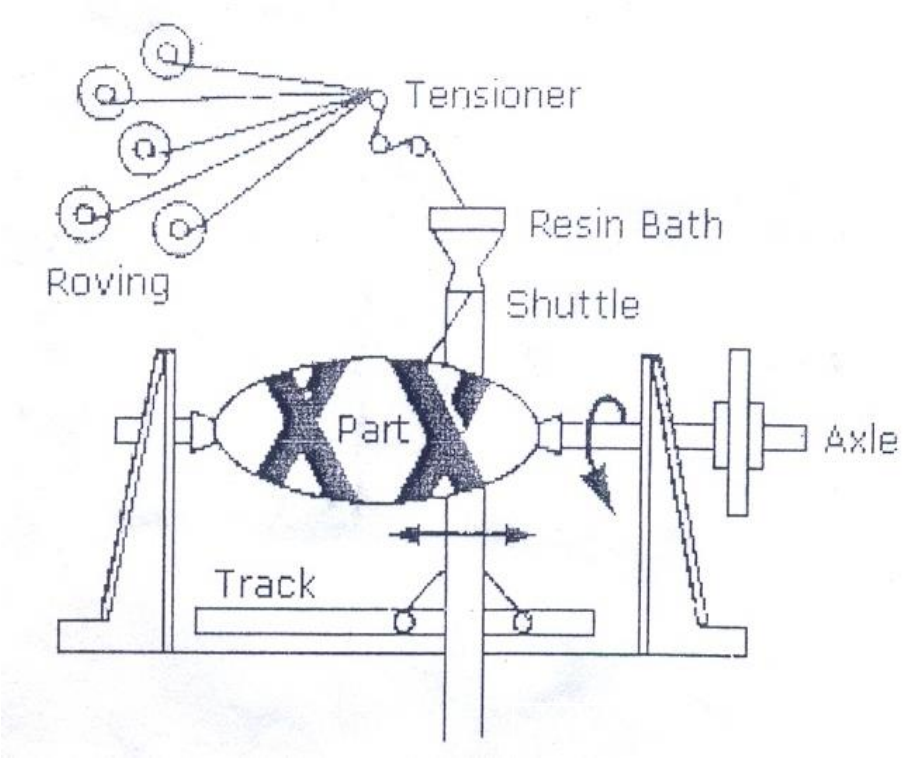
d)	The principles of hot straightening  Beams Web stiffeners which are to be welded or riveted. When fabricating stiffeners which are to be welled on position it is important that the Stiffener is an exact fit on the beam. The slope of the tapered flanges should be copied faithfully. With triangular-shaped gussets 'feather edges' must be avoided, the sharp corners should be cut off, for otherwise the strength of the assembly may be reduced rather than increased. Another important reason for cutting off the corners of webs or gussets is to provide ample clearance from fillet welds or bending radii.	2m (dia) 2m	**4**

e)	 **Description:-** Above fig a shows that when the depth of I section is not much there is no chance of bending or twisting so stiffeners are not required. As the depth of I section i.e. the height of web increases the tendency of bending and twisting increases. So as to avoid this the web stiffeners are attached to strengthen the Section as shown in fig b.	2m (dia) 2m	**4M**
f)	Description of processes: A brief description of each process with neat sketches is as follows; • Prepegging --- It involves the application of formulated resin products, in solution or molten form, to a reinforcement such as carbon, fibreglass or aramid fibre or cloth. The reinforcement is saturated by dipping through the liquid resin. In an alternative method called a Hot Melt Process the resin is impregnated through heat and pressure. The Hot Melt System uses resins with a very low percentage of solvents.	4m (any 1 method)	**4M**



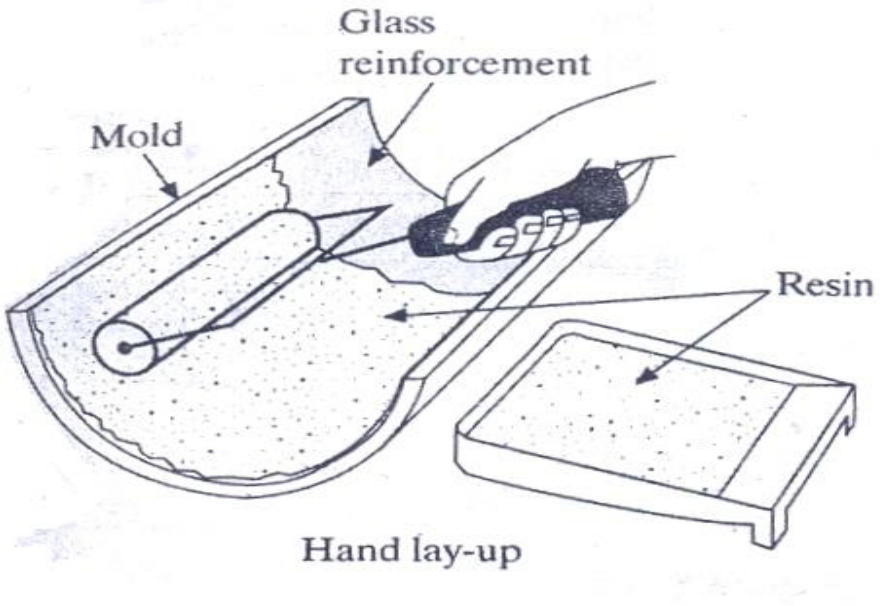
OR

- Wet filament winding --- In this process, continuous fibre reinforcement materials are drawn through a container of resin mixture and formed onto a rotating mandrel to achieve the desired shape. After winding, the part is cured in an oven. This process can also be used as preimpregnated fibre tows called towpregs.



OR

- Hand lay-up or contact moulding --- This involves coating a mould or form with a layer of resin; a layer of glass reinforcement is applied, and the reinforcement is thoroughly saturated with resin. The process is repeated until the desired composite thickness is achieved (the maximum thickness is usually 9mm). The polymer matrix is usually a polyester or epoxide.



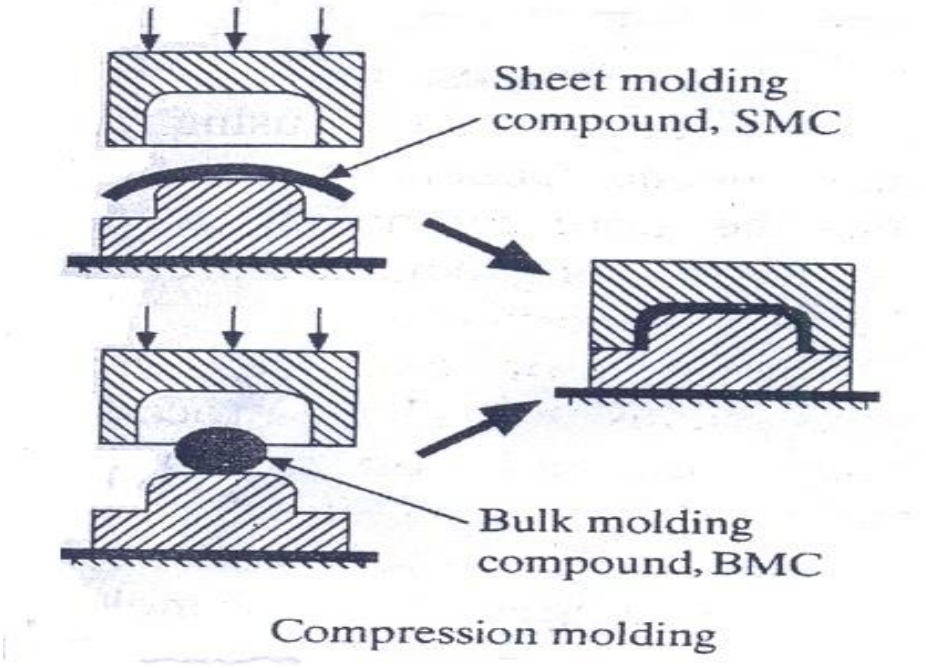
OR

- Compression moulding --- It is similar to the process described for unreinforced thermosets, except that special techniques are required to introduce the glass reinforcement into resins that have to be catalyzed and have a limited pot life after catalyzation.

  In the sheet moulding process, catalyzed polyester or epoxy resin is kneaded into the glass reinforcement by rollers. Special fillers are added to keep the resin from being tacky and inhibitors are added to increase the pot life of the catalyzed resin. The finished sheet, called sheet moulding compound (SMC), consists of resin and reinforcement and this sheet can be cut to an appropriate size and pressed in a matched mould to make the finished part. The moulds are heated to complete the cross-linking of the resin.

  A similar product, called bulk moulding compound (BMC), is produced by adding thickeners to the resin; it is kneaded like dough with chopped fibres to make a compression moulding charge that resembles a glob of dough. The heating and pressing are the same as in sheet moulding.

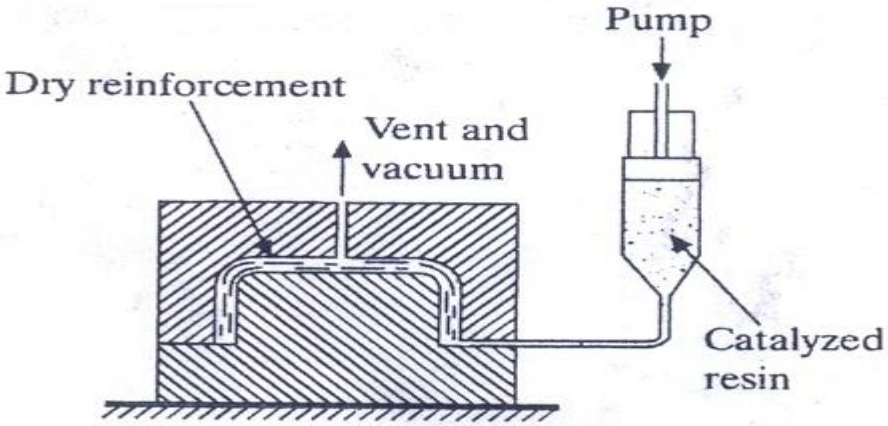
  Both processes can be used for large mouldings such as automobile fenders.



Compression molding

OR

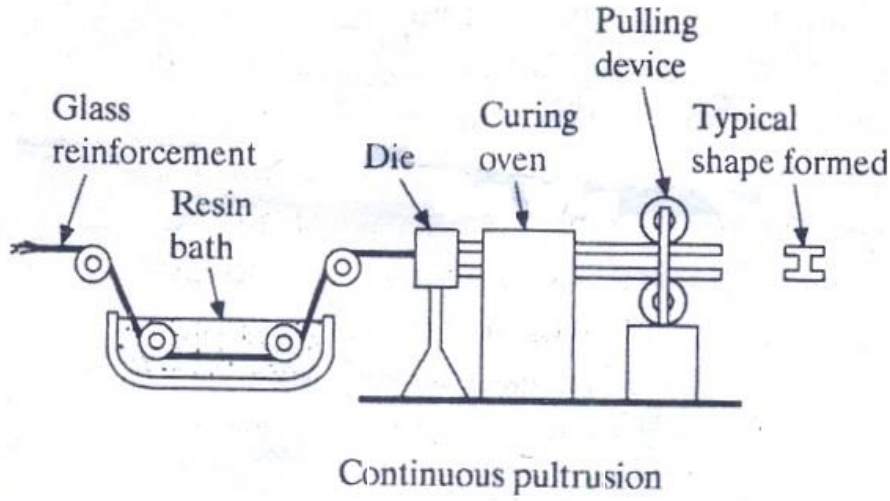
- Resin transfer moulding --- This process has evolved as a way to speed up contact and to improve the part by having two finished surfaces instead of one. This process requires a close fitting mould. Glass reinforcement is cut and shaped to the desired thickness in the open mould. The mould is then closed and evacuated and catalyzed resin is pumped into the bottom of the mould. When the mould is filled, the pump is shut off, the resin line is stopped off and the part is allowed to cure. This is becoming an important process for the production of large RTP boats. It is replacing hand lay-up.



Resin transfer molding

OR

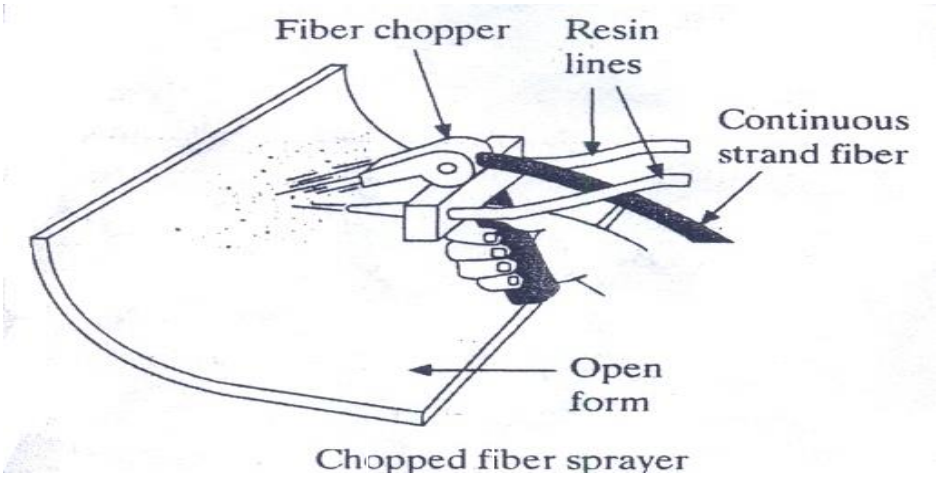
- Continuous pultrusion --- It is a process for making glass-reinforced shapes that can be generated by pulling resin-impregnated glass strands through a die. The glass is pulled through a resin bath; it is shaped as it goes through a heated bath and the resin cross-links in the heated die and combined curing section. Pipes, channels, I-beams and similar shapes can be generated. Pultrusion structural shapes are frequently used for decking and structural members around corrosive chemical tanks.

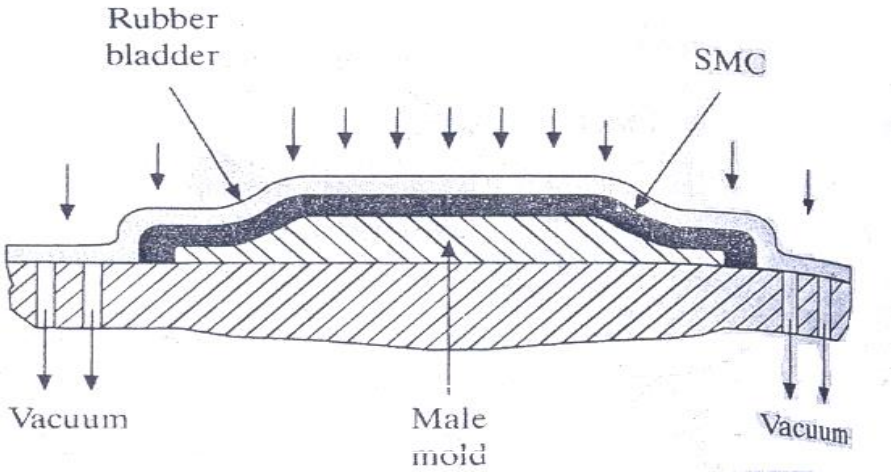


Continuous pultrusion

OR

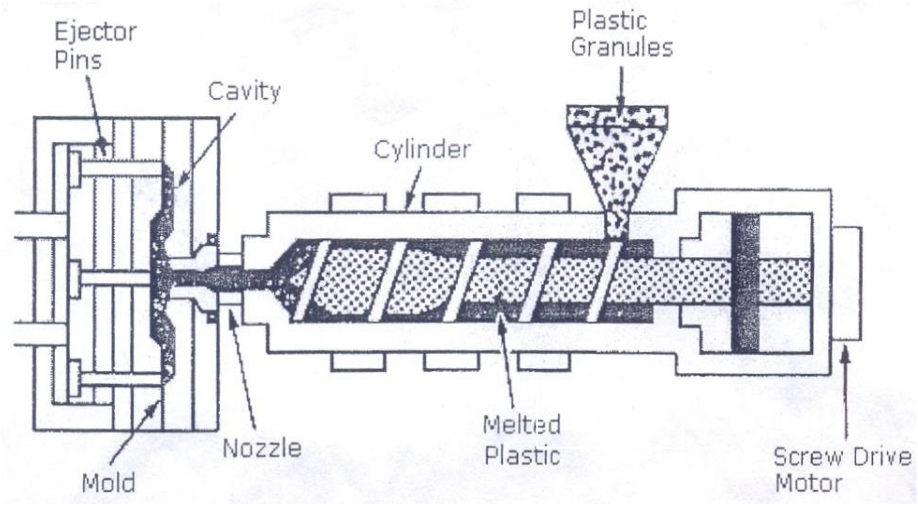
- Chopped fibre spraying --- It performs the same job as hand lay-up, but it

	is much faster. Two component resins are mixed in a hand-held gun and sprayed at a mould surface. A chopper is incorporated in the gun. It chops continuous strands of glass into short lengths to act as reinforcement in the composites. This process can be used to make large reinforced composites such as boats, shower stalls and bathtubs. Chopped fibre reinforcements, however are not as strong as hand lay-ups that are reinforced with mat or woven roving.  **OR** • Vacuum bag forming --- It is used to shape sheet moulding compounds to complex shapes. This process uses atmospheric pressure to do the forming, thus eliminating the high cost of matched metal moulds. It is possible to cure the SMC in the vacuum bag rig using temperature-resistant silicone rubbers for the forming bladder, but the more common practice is to use vacuum-bag forming to make a preform and cure the preform in another mould.		



OR

- Injection moulding --- Chopped fibres and particulate reinforcements are blended into the moulding pellets/granules. However this method is not normally used in PMC processes due to fibre damage in the plasticating barrel. Thermoplastic granules are fed via a hopper into a screw-like plasticating barrel where melting occurs. The melted plastic is injected into a heated mould where the part is formed. This process is often fully automated.



OR

Joining Composites:

Introduction: In any product, there are generally several parts or components joined together to make the complete assembly. These parts are interconnected with each other to make the final product. The purpose of the joint is to transfer loads from one member to another, or to create relative motion between two members.

Joints are but usually avoided in a structure as a good design policy. In any structure, a joint is the weaker area and most failures emanate from joints. Because of this, joints are eliminated by integrating the structure.

In an ideal product, there is only one part. Fibre-reinforced composites provide the opportunity to create large, complicated parts in one shot and reduce the number of parts in a structure.

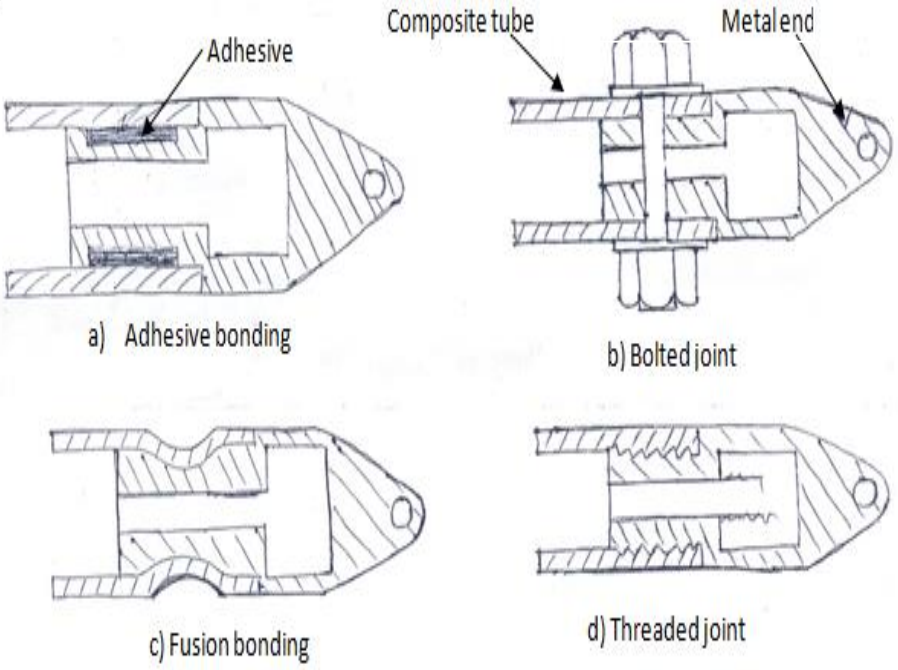
There are two types of joints used in the fabrication of composite products:

- Adhesive bonding
- Mechanical joints

Adhesive bonding is the more common type of joint used in composites manufacturing.

In adhesive bonding, two substrate materials are joined by an adhesive. Mechanical joints for composites are similar to the mechanical joints of metals. In mechanical joints: rivets, bolts and / or screws are used to form the joints. Fusion bonding is also used for joining purposes. It is used to join thermoplastic parts by means of heat.

The figures below show an application in which a composite tube is joined with a metal end by various means

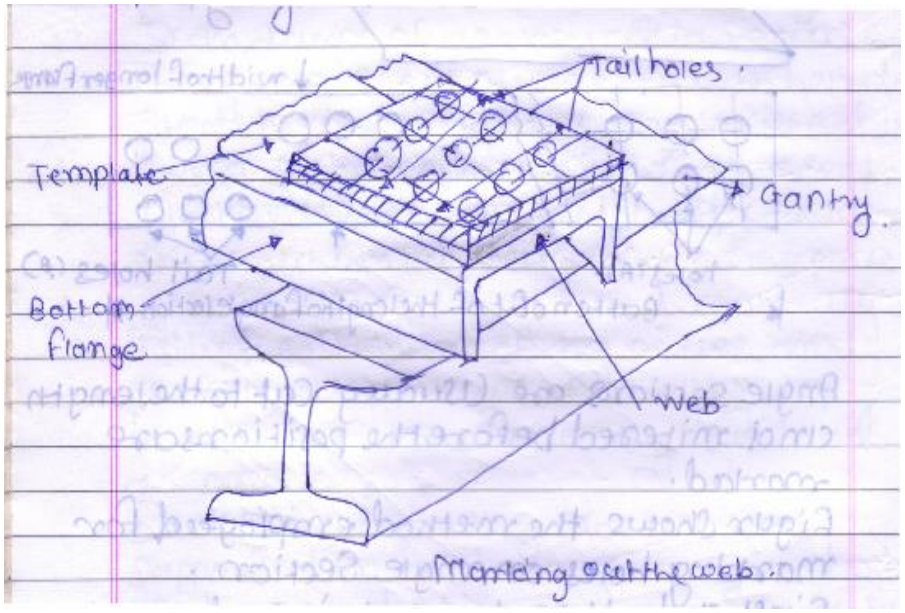
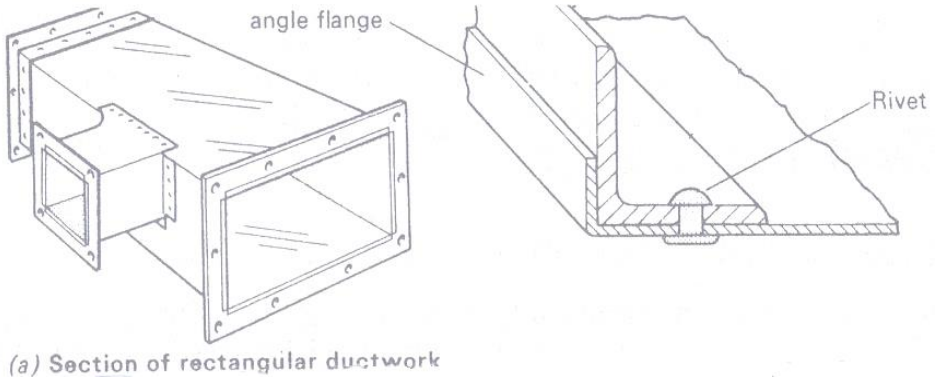


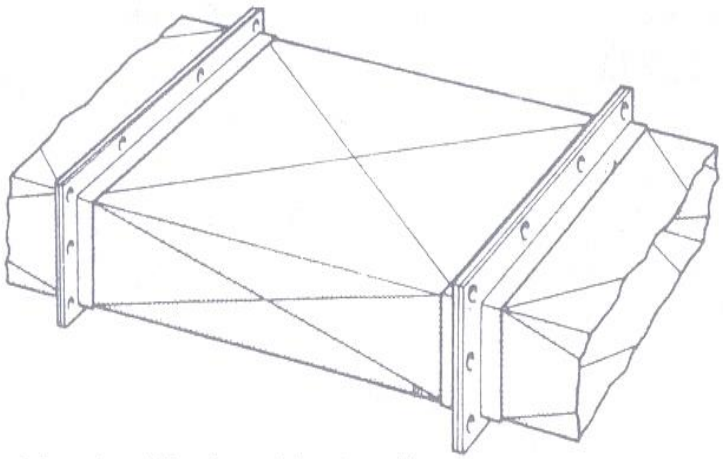
5.	Attempt any FOUR of the following	4*4	16
a)		04 marks (any 4.)	04

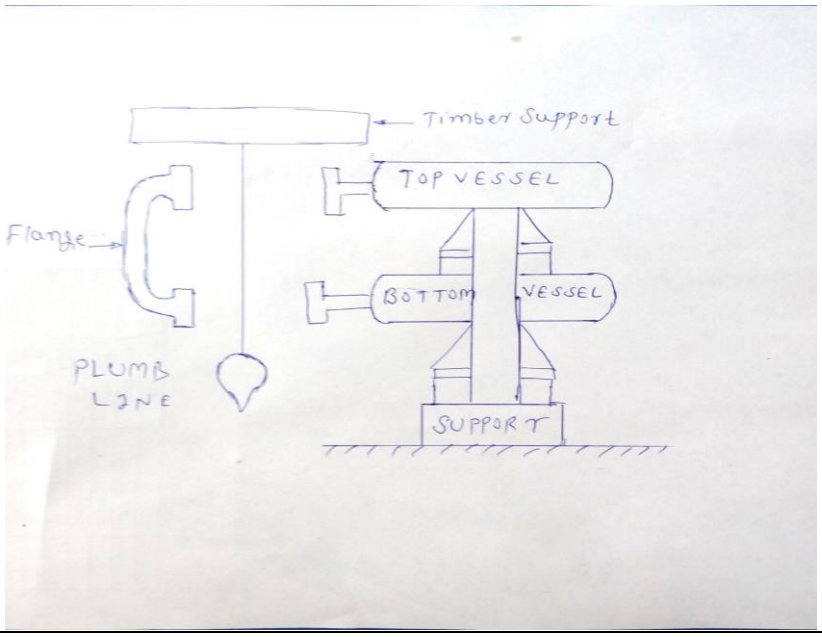
Sr. NO.	Direct Marking	Template Method
1	It is time consuming Process.	Time required is less as compared to direct method.
2	Repetitive measuring and marking-off of the same dimensions, where a number of identical parts or articles are required.	No need of repetitive measuring and marking off.
3	Wastage of material may takes place	Avoid unnecessary wastage of material.
4	Complicated Parts like angle sections cannot be marked	It is best suitable of complicated sections.
5	Less precise method	More precise method.
6	Skilled worker is required	Less skilled worker can do the process.

b) 04m (any 4) **04**

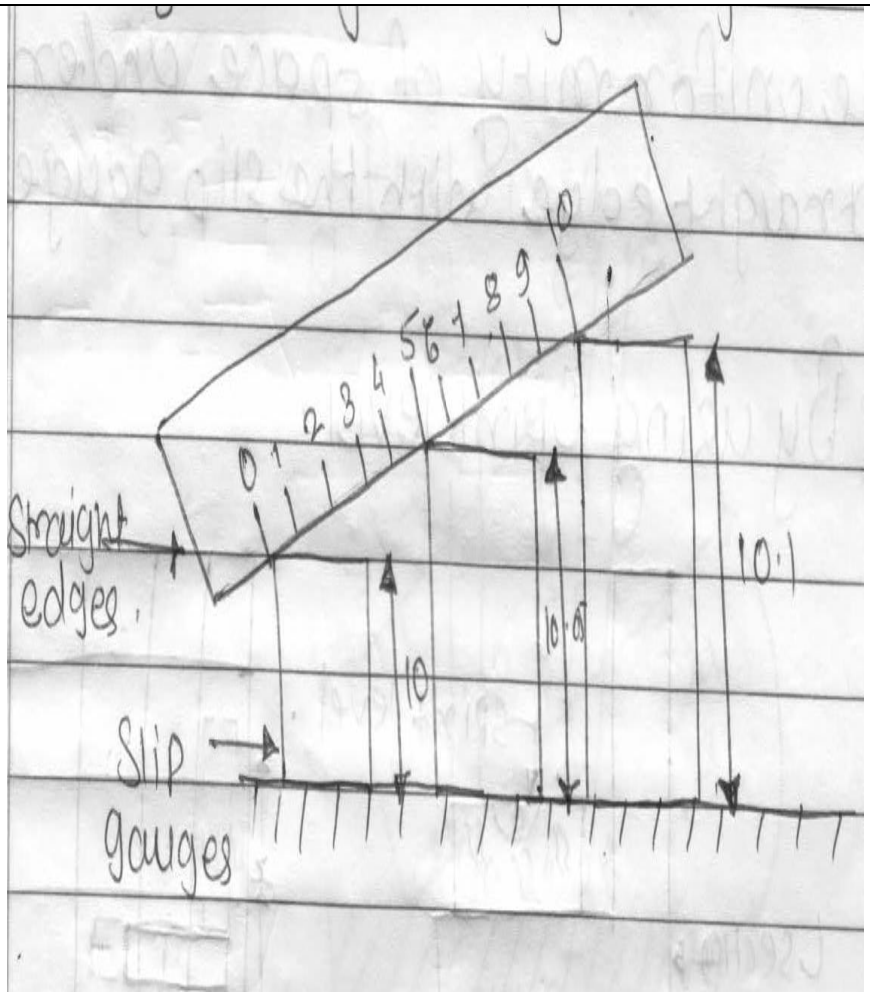
Characteristics	Line standards	End standards
Accuracy of measurement	Limited to + 0.2mm. For high accuracy, scales have to be used along with microscopes.	Highly accurate for measurement of close tolerances, up to + 0.001mm.
Time of measurement	Quick and easy.	Time consuming.
Effect of use	Scale markings are not subjected to wear but end of scale is worn. Thus, it may be difficult to assume zero of scale as datum.	Measuring faces get worn out. To take care of this, end pieces can be hardened. Built in datum is provided.
Other errors	Parallax errors can occur.	Improper wringing of slip gauge may introduce error. Change in laboratory temperature may lead to some errors.
Manufacture and cost of equipment	Simple and low.	Complex and high.
Examples	Yard, metre	Slip gauges, ends of of micrometer anvils, length bars, etc.

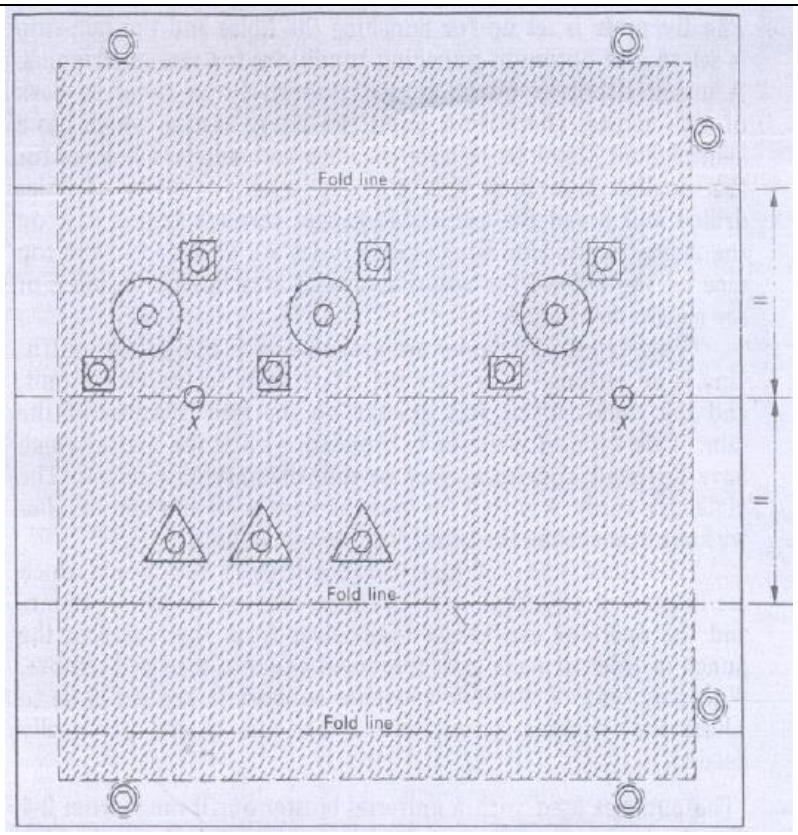
c)	**Template as a means of marking of holes in channel sections:-**  -Channel sections are cut to the required length placed on a simple gantry with the web horizontal. -The wooden template is kept so that heel line of the template matches with the hill line of the channel sections at the uppermost portion and clamped into position. -The hole position in the web are marked through the template with a nipple punch as shown in fig. -Afterward the channel section is tilted and the tail holes are marked with the help of template and a punch on the bottom flange and top flang	02 Marks (dia) 02 marks (expln.)	**04**
d)	The figures below show the use of angle stiffeners for duct work:  	2m (dia)	**4M**

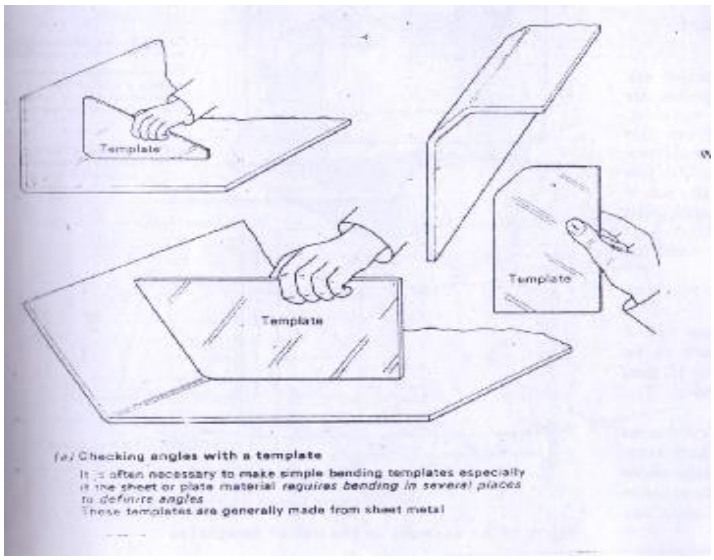
	Welded angle frames are widely used as a means of stiffening and supporting rectangular ducts for high velocity systems. They also serve as a joining media when assembling sections together by bolting as shown in the figures above.  (b) Diamond-break stiffening of duct walls Slight diagonal fold from corner to corner The large sizes of square or rectangular ducting tend to drum as the air pressure passing through them varies. To overcome this drumming it is necessary to provide adequate stiffening to the walls of the duct. This may be achieved by use of swaging, but often a 'diamond-break' is used as shown in the figure above.	2m (expainat ion)	
e)	1) **Abrasive Blast Cleaning:-** **Abrasive blasting** is the operation of forcibly propelling a stream of abrasive material against a surface under high pressure to smooth a rough surface, roughen a smooth surface, shape a surface, or remove surface contaminants. A pressurized fluid, typically compressed air, or a centrifugal wheel is used to propel the blasting material (often called the *media*). There are several variants of the process, using various media; some are highly abrasive, whereas others are milder. The most abrasive are shot blasting (with metal shot) and sandblasting (with sand). Moderately abrasive variants include glass bead blasting (with glass beads) and media blasting with ground-up plastic stock or walnut shells and corncobs. A mild version is soda blasting (with baking soda)	4m (any 1 process)	**4M**

	In addition, there are alternatives that are barely abrasive or nonabrasive, such as ice blasting and dry-ice blasting. **OR** **2)TUMBLING:-** Tumbling, often is the least expensive process for removing rust and scale from metal parts. Parts configuration & size are the primary limitation for the process. Tumbling in dry abrasives is effective for removing rust and scale from small parts of simple shapes. However parts of complex shapes, with deep recess & other irregularities cannot be descaled uniformly by tumbling. It may require a several hours of tumbling, if the method is used. The addition of descaling compounds instead of deburring compounds will often decreases the tumbling time by 75 per cent. **OR** **3) Barrel Rolling:-** Barrel rolling and tumbling are quite similar operations, except that the barrel is loaded only to 40 to 60 percent capacity, while in tumbling a drum is generally packed nearly full. Abrasives such as cinders, slag, granite chips, and sharp sand are placed in the barrel with the work pieces, along with water or a dilute acid solution. Sometimes mineral matter or scrap punching are added to the wet rolling. As the barrel turns the mass rolls over and falls to the bottom of the barrel. This motion cuts down the surface of the parts.		
f)		2m (dia)	**4M**

	Description:- Fig shows the vertical alignment of bottom vessel with top vessel with the help of a plumb line. In this method first of all the bottom vessel is required to be aligned with the help of spirit level. Then the top vessel is being aligned with the help of plumb line which is connected with a timber support. Then after aligning both the vessels being attached with the help of flange as shown in fig.	2m	
6.	**Attempt any <u>four</u> of the following**	**4*4**	**16**
a)	Chemical Cleaning (Removal of Oxide Scales and Surface Defects): Chemical cleaning is divided into two distinct groups: • Organic solvent based • Alkaline and acid aqueous method Emulsifiable Solvent and Emulsion Cleaning The component is either sprayed or immersed in an organic solvent which contains emulsifying agents. After comprehensive coverage, the component is rinsed with water to emulsify the solvent together with contaminating oil or grease. Another advantage is that treatment is usually at ambient temperature, although cleaning efficiency is directly related to physical agitation over the component surface during the water rinsing stage. Alkaline and Acid Cleaners Alkaline cleaners are the most extensively used chemical cleaners for substrate pre-treatment, primarily on grounds of economics, safety, and resistance of steels to attack. They are also commonly used before metal undergoes conversion coating. The degree of alkalinity is known to effect phosphate conversion coatings (particularly zinc), with higher the pH, coarser the resulting crystal structure. In general, a finer structure is preferred for improved mechanical strength of the phosphating and gloss of the applied powder coating. Acid cleaners have a relatively restricted application, limited to mainly light rust removal. They are generally inefficient for oil and grease removal, and if the component is soiled as well as rusty, then acid cleaning is usually a follow-on to solvent or alkaline.	04 marks (any ONE)	**04**

b)	 A straight edge is a measuring tool which consists of a length of steel of narrow and deep section so as to avoid bending of that rod. For(Changing the)checking the straightness edge is taken on the slip gauges and two are vivid again the light which clarify indicates the straightness. If this two surfaces are perfectly straight the there is a negligible gap. If the detraction of light is red in colour a gap of 0.0012 to 0.0017mm and if the detraction if light is blur in colour the gap is approximately 0.0075mm. More accurate method is support the straight edges on equal slip gauges at the correct points for minimum deflection sand measurement the uniformity of space under the straight edge with slip gauge. In the above figure the staright edge is supported on the slip gauges at several points and with the help of that we can conclude the surface is perfectly flat or not.	02M (DIA) 2M	**04**

c)	 **Marking of an Instrumental Panel:-** • The sequence of operations for marking of holes may be as follows: A template is used to mark the positions of all the holes. Such a template is usually marked out on mild steel plate on a surface table using a Vernier height gauge and an angle plate. Small pilot holes are drilled, and once the template has been passed by inspection these are opened out with the correct size drill to suit the diameter of a nipple punch. The template is provided with location buttons to give an accurate location for the blanks. Figure below shows the template positioned over the blank ready for transferring the hole positions with a nipple punch. The use of such a template is a fool proof system which not only provides identical hole positions on each blank, but dispenses with the use of guides and locations having to be set up on the process .	02m (dia) 2m	**04**

d)	**Template As a means of checking:-**  • These are usually made up of sheet metal or wood although for some applications template marking paper may be used. • Above fig shows the use of template for checking • In fig a, b & c template is used for checking the angles. • In fig d checking contour or radius corners template is used.	02 m (dia) 2m	**04**
e)	Dry processes of surface cleaning: i) Thermal degreasing: Work pieces soiled with oil are blow dried with hot air at a temperature of about 250^0C. This degreasing principle is based on the evaporation of oil by correspondingly applying energy. The oil vapors are subsequently condensed and separated from the laden air. Following processing, the oils can be reused in production (recycling rate up to 80%). **OR** ii) Vacuum thermal degreasing: Before heating the work pieces, the system is evacuated to less than 1mbar and the pressure then increased again with N_2. After heating in conjunction with extensive inerting, the oil is evaporated in a vacuum of approximately 10 mbar at a temperature of 150^0C to 200^0C. The oils are condensed and can be reused.	04 marks (any one)	**04**

	OR iii) Degreasing with CO_2: Supercritical CO_2 has been used successfully for many years in the food and pharmaceutical industries for the purpose of solvent – free dry extraction. Work pieces are cleaned with super – critical CO_2 in high pressure systems at approximately 500 bar and an operating temperature of 190^0C		
f)	**Error:-** **it is difference between the measured value and the true value.** Absolute static error of a particular instrument is given by, $\delta A = Am - At$ *Where,* δA= *Absolute static error* $Am = Measured\ Value\ of\ quantity$ $At = True\ value\ of\ quantity.$ **Sources Of Errors:-** **1) Human Error:** 2) **Systematic Error:-** A) Instrumental error:- B) Environmental error:- 3) **Random errors:-**	02 marks (definati on) 2m (sources)	**04**