



SUMMER – 15 EXAMINATIONS

Subject Code: **17456**

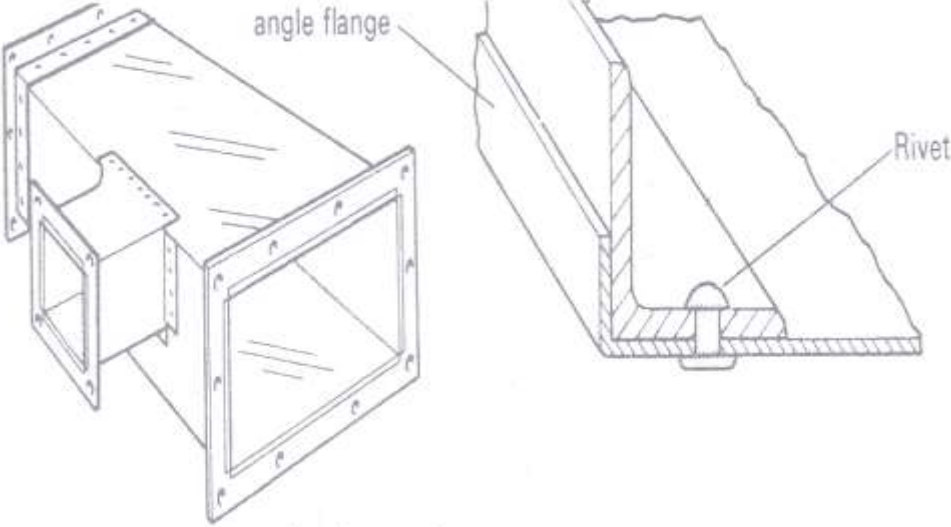
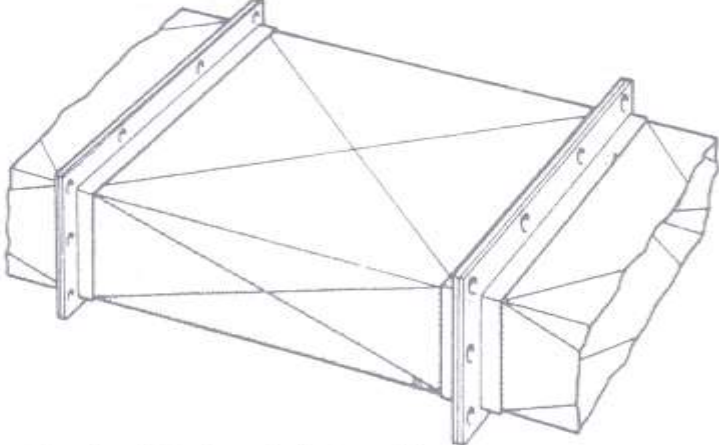
Model Answer

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.



Q. NO.	MODEL ANSWER			MARKS	TOTAL
1.	Attempt any five of the following			5*4	20
a)	SR NO	ACCURACY	PRECISION	4m (ANY 4 POINTS)	04
	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.		
b)	End standard: These are defined as the distance between the end surfaces of the material standards and are very commonly used in laboratories and engineering workshops for all practical purposes . End standards require to have accurately made parallel surfaces with heat-treated ends, so that they remain stable as their use depends on sense of touch and/feel. Advantages:- 1) They are more accurate 2) As it does not have graduations less chance of mistakes or Parallax error. Example: eg. slip gauges, micrometer anvils, etc.			2m 1m 1m	04
c)	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			04 m (any 4 points)	04

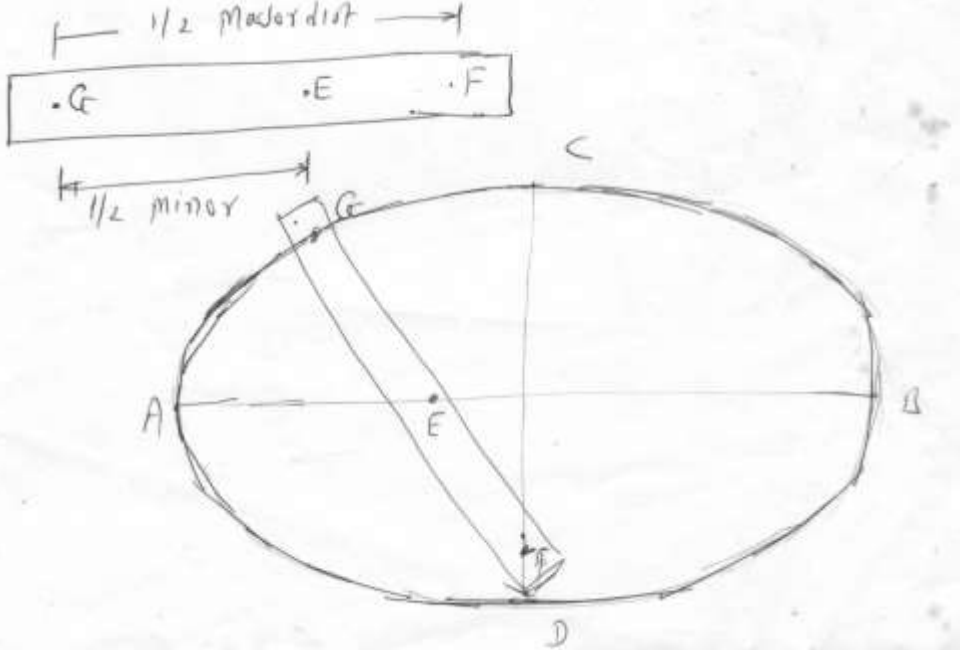
	<p>that the complete layout can be economically accoodated.</p> <ol style="list-style-type: none">3) To act as a guide for a cutting process.4) As a simple means of checking bend angles and contours during for mining and rolling operation.5) As a precise method of marking of holes position on sheet metal fabrications, plate work, structures work such as angles, channels, columns and are arms.		04
d)	<p>The figures below show the use of angle stiffeners for duct work:</p> <div><p>(a) Section of rectangular ductwork</p></div> <p>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.</p> <div><p>(b) Diamond-break stiffening of duct walls <i>Slight diagonal fold from corner to corner</i></p></div>	02m (Dia)	



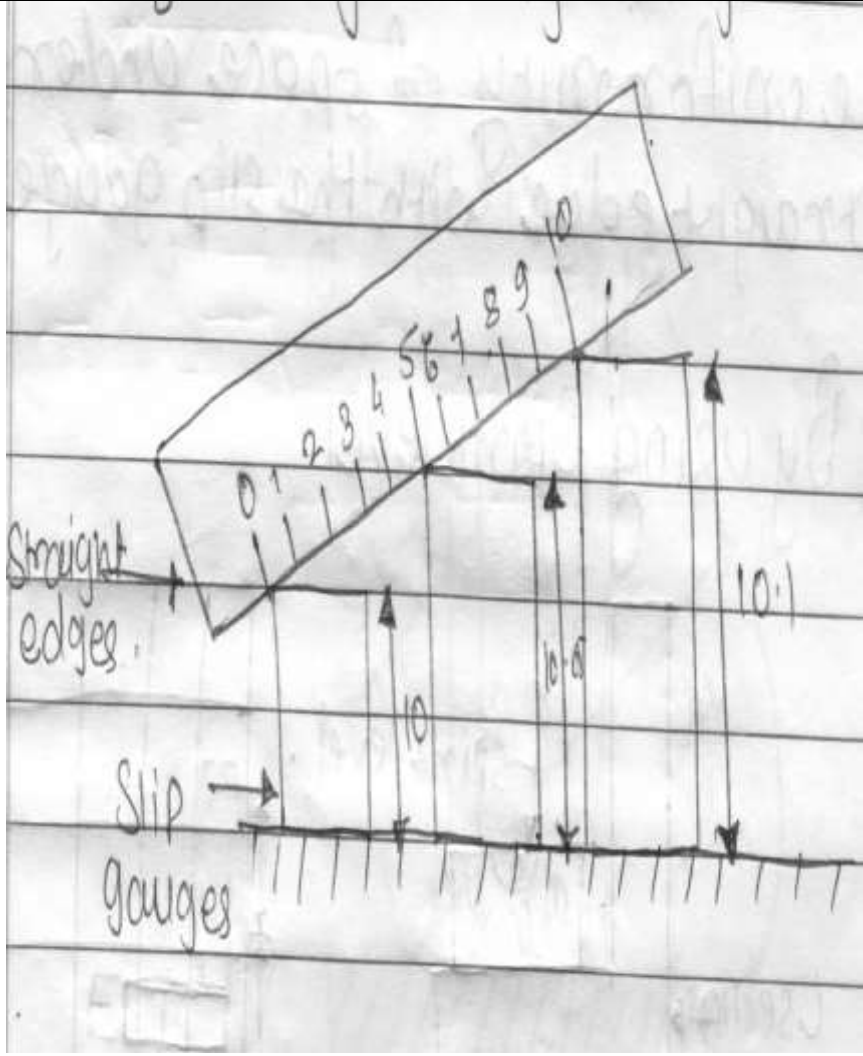
	<p>The large sizes of square or rectangular ducting tend to drum as the air pressure passing through them varies. To overcome this drumming it is necessary to provide adequate stiffening to the walls of the duct. This may be achieved by use of swaging, but often a ‘diamond-break’ is used as shown in the figure above.</p> <p>Reasons for stiffening: The three main reasons for stiffening sheet metal are;</p> <ul style="list-style-type: none">• To give strength and rigidity to the material.• To produce a safe edge.• For decorative purposes.																							
e)	<table><tr><th>Parameters</th><th>Manual straightening</th><th>Machine straightening</th></tr><tr><td>Cost</td><td>Less cost</td><td>High cost</td></tr><tr><td>Time</td><td>More time</td><td>Less time</td></tr><tr><td>Ease of evaluation</td><td>Difficult to evaluate the job done</td><td>Easy to evaluate the job done</td></tr><tr><td>Labor wage</td><td>Difficult to fix the wage rate due to inconsistency in job performance</td><td>Easy to fix the wage rate as per specification of machine used in job performance</td></tr><tr><td>Quality of straightening</td><td>Poor</td><td>Good</td></tr><tr><td>Labor skill</td><td>Semi – skilled to skilled</td><td>Unskilled to semi – skilled</td></tr></table>	Parameters	Manual straightening	Machine straightening	Cost	Less cost	High cost	Time	More time	Less time	Ease of evaluation	Difficult to evaluate the job done	Easy to evaluate the job done	Labor wage	Difficult to fix the wage rate due to inconsistency in job performance	Easy to fix the wage rate as per specification of machine used in job performance	Quality of straightening	Poor	Good	Labor skill	Semi – skilled to skilled	Unskilled to semi – skilled	04 marks (any 4)	04
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f)	<p>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.</p> <p>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.</p>			04 marks (expln.)	04																			

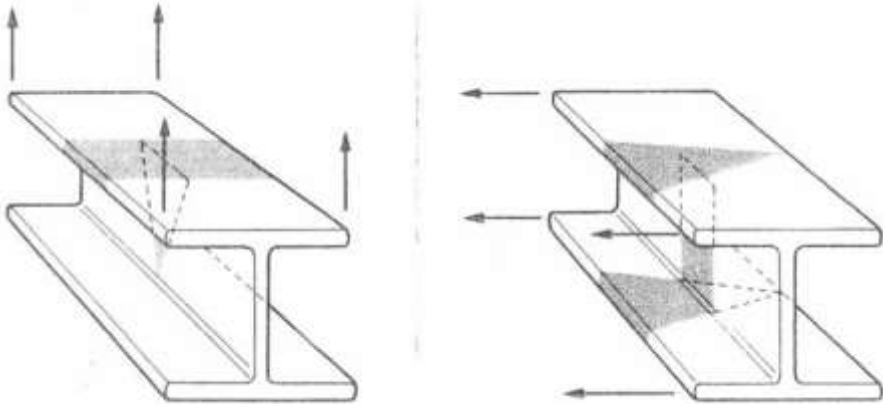


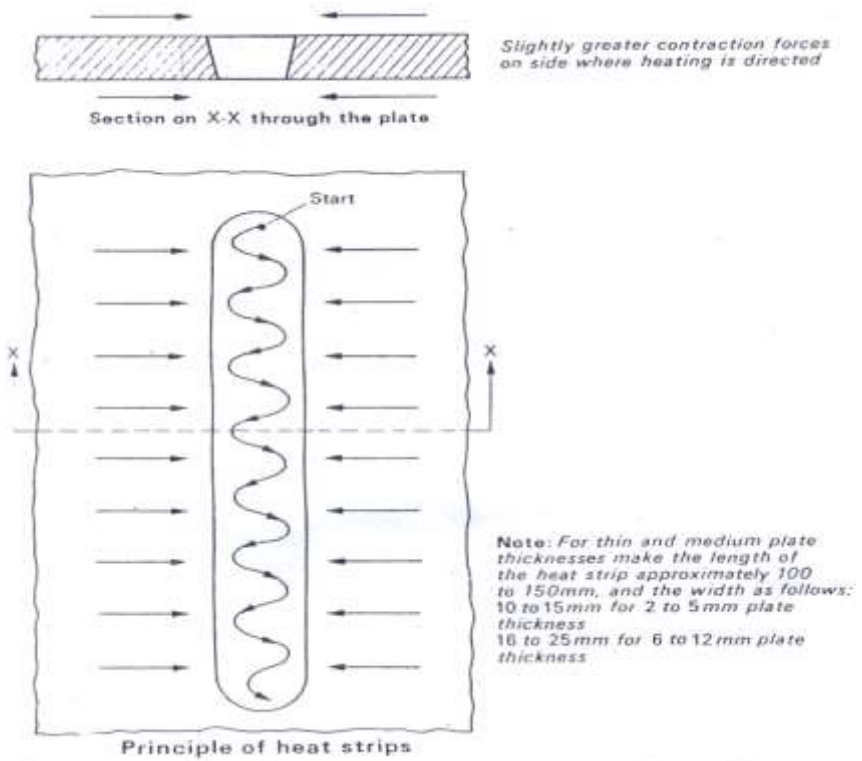
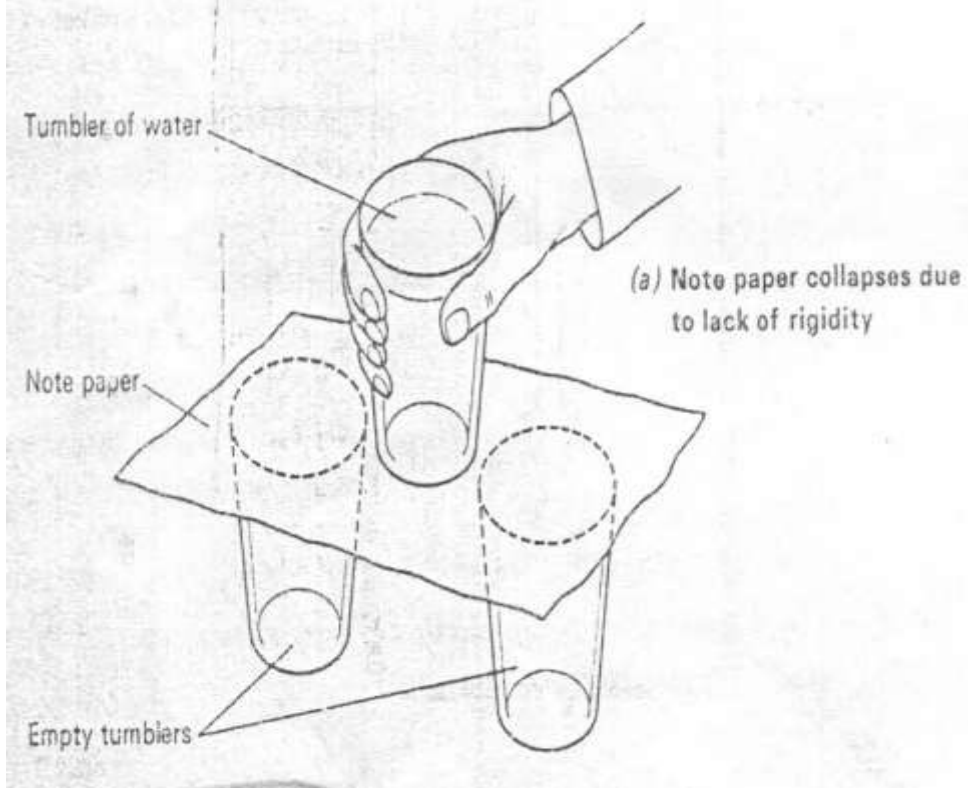
	<p>There are two types of joints used in the fabrication of composite products:</p> <ul style="list-style-type: none">• Adhesive bonding• Mechanical joints <p>Adhesive bonding is the more common type of joint used in composites manufacturing.</p> <p>In adhesive bonding, two substrate materials are joined 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.</p> <p>The figures below show an application in which a composite tube is joined with a metal end by various means</p>		
g)	<p>Need for surface preparation:</p> <p>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.</p>	04 marks	04
h)	<p>Error:- Difference between the actual value of a quantity and the value obtained by a measurement. Repeating the measurement will improve (reduce) the random error (caused by the accuracy limit of the measuring instrument) but not the systemic error (caused by incorrect calibration of the measuring instrument). In case of that we need to add or subtract the error.</p> <p>Types of errors:-</p> <ol style="list-style-type: none">1) Gross Errors2) Systematic Errors <p>(i) Instrumental Errors</p> <p>(ii) Environmental Errors</p> <ol style="list-style-type: none">3) Observational Errors4) Random Errors	2m (def) 2m (types)	04
2.	Attempt any <u>two</u> of the following	2*8	16
a)		04 m	08

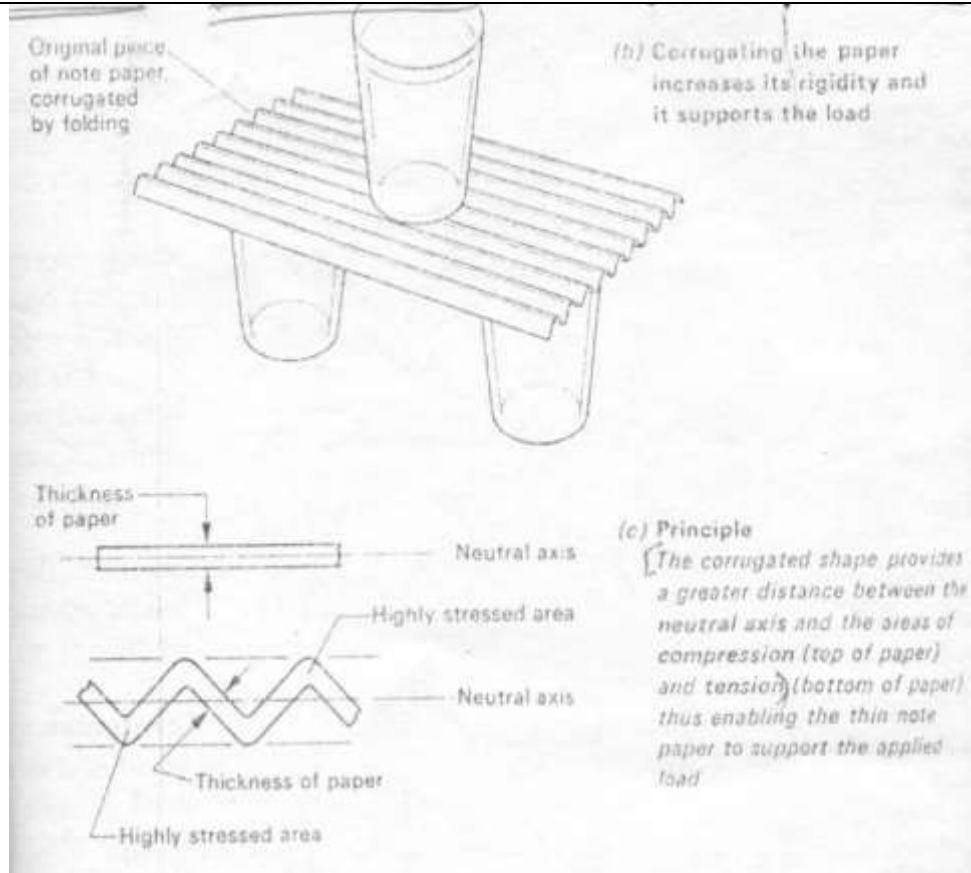
	<p>Tools used in Marking:</p> <ol style="list-style-type: none"> 1) Surface Plate 2) Angle Plate 3) Scriber 4) Height gauge 5) Tri square 6) Protractor 7) Punch 8) Ball hammer 9) Dividers or Compass <p>Method of plotting on ellipse using trammels:</p>  <ul style="list-style-type: none"> ➤ The trammel 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. ➤ 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 represntly 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. 	<p>(any 4)</p> <p>02 marks (diag.)</p> <p>&</p> <p>02 marks (expln.)</p>	
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b)	<p>Following are the instruments:-</p> <ol style="list-style-type: none"> 1) Spirit level 2) Plumbblock 3) Timber Plate 4) Surveyors Level <p>Allignment Test :-</p> <p>Horizontal datum</p> <p>Spirit- level: Alignment of surface in horizontal and vertical plane is very important for installation of machine tool and fabrication of pressure vessels, building structures and material handling equipments.</p> <p>Horizontal datum can be measured and alignment can be done by spirit level. For this the level is placed on the table of the machine to be aligned and for other types of work such as frame and structure. It may be suitably placed on horizontal surface under test.</p> <p>The surface under test is divided into horizontal and vertical lines with spacing equal to the length of the spirit level. The level is then placed along this line all over the surface and bubble readings are noted. Any surface deviation from the horizontal is noted and same can be corrected by using foundation bolts.</p>	02 m	08
		3M	
		3M	

c)	 <p>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 detracton of light is red in colour a gap of 0.0012 to 0.0017mm and if the detracton 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.</p>	04 marks (diag.)	08
		04 marks (expln.)	

3.	Attempt any <u>two</u> of the following	2*8	16
a)(i)	<p data-bbox="261 233 703 268">The principles of hot straightening</p> <div data-bbox="285 300 1162 701">  </div> <p data-bbox="305 726 386 751">Beams</p> <p data-bbox="261 762 1162 1081">Web stiffeners which are to be welded or riveted. When fabricating stiffeners which are to be welded 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.</p>	02m	04
a)ii)	<p data-bbox="261 1094 493 1129">Use of heat strips:</p> <p data-bbox="261 1129 1235 1339">The figure below shows the use of heat strips for the 'hot straightening' and 'hot shrinking' of plate and wide sections. The shrinking forces will be approximately equal for both sides of the plate. The figure above shows the application of a heat strip which, upon cooling, causes the metal to become compressed, because the contraction forces come in at right angles to the strip.</p> <p data-bbox="261 1350 1235 1528">Heating is commenced at one end of the strip, making sure that the correct heat goes right through the plate (cherry red 750°C). The whole heating operation is a continuous one, employing a zigzag movement of the heating torch towards the opposite end. On cooling the plate will be shorter in length in the locally heated area.</p> <p data-bbox="261 1539 1235 1675">The length and width of a particular heat strip can be determined by the thickness of the plate. As a general guide: for thicknesses from about 10mm to 30mm, the width of the heat strip should be between 20mm and 30mm, the length of the heat strip between 130mm and 200mm.</p>	02 marks (expln.)	04

	 <p>Section on X-X through the plate</p> <p>Slightly greater contraction forces on side where heating is directed</p> <p>Start</p> <p>Note: For thin and medium plate thicknesses make the length of the heat strip approximately 100 to 150mm, and the width as follows: 10 to 15mm for 2 to 5mm plate thickness 16 to 25mm for 6 to 12mm plate thickness</p> <p>Principle of heat strips</p>	02 marks (diag.)	
b)	 <p>Tumbler of water</p> <p>Note paper</p> <p>Empty tumblers</p> <p>(a) Note paper collapses due to lack of rigidity</p>	4m (dia)	08



4m

Stiffening of fabricated material (introduction)

The basic principle of stiffening may be illustrated by a popular party trick - that of supporting a tumbler of water on a piece of note paper bridging two other tumblers. This simple trick is explained in Fig.

A sheet metal panel will not support a very great load due to the thinness of the material. A metal plate of the same surface area will support a fairly substantial load because of its extra thickness. Unfortunately, although the metal plate is much more rigid than the sheet metal panel, this rigidity is obtained at the expense of considerable additional weight. This STRENGTH/WEIGHT ratio is a very important factor in the fabrication industry and, fortunately, it is possible to produce a multiplicity of light fabrications which are rigid and strong. This may be achieved in a number of ways which involve imparting stiffness to the material itself or by the addition of stiffeners.

Methods of imparting stiffness to sheet metal

The three main reasons for stiffening sheet metal are:

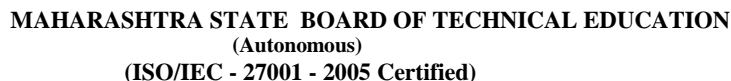
1. To give strength and rigidity to the material.
2. To produce a safe edge.
3. For decorative purposes.



c)	<p>In case of manufacturing unit, plant layout may be of four types:</p> <p>(a) Product or line layout (b) Process or functional layout (c) Fixed position or location layout (d) Combined or group layout</p> <p>IMPORTANCE:- Plant layout is an important decision as it represents long-term commitment. An ideal plant layout should provide the optimum relationship among output, floor area and manufacturing process. It facilitates the production process, minimizes material handling, time and cost, and allows flexibility of operations, easy production flow, makes economic use of the building, promotes effective utilization of manpower, and provides for employee's convenience, safety, comfort at work, maximum exposure to natural light and ventilation. It is also important because it affects the flow of material and processes, labours efficiency, supervision and control use of space and expansion possibilities etc.</p> <p>APPLICABILITY OF PLANT LAYOUT</p> <p>1) Plant layout is applicable to all types of industries or plants. Certain plants require special arrangements which, when incorporated make the layout look distinct from the types already discussed above. Applicability of plant layout in manufacturing and service industries is discussed below. In case of the manufacturing of detergent powder, a multi-storey building is specially constructed to house the boiler. Materials are stored and poured into the boiler at different stages on different floors. Other facilities are also provided around the boiler at different stations.</p> <p>2) Another applicability of this layout is the manufacture of talcum powder. Here machinery is arranged vertically i.e. from top to bottom. Thus, material is poured into the first machine at the top and powder comes out at the bottom of the machinery located on the ground floor. Yet another applicability of this layout is the newspaper plant, where the time element is of supreme importance, the accomplishment being gapped in seconds. Here plant layout must be simple and direct so as to eliminate distance, delay and confusion. There must be a perfect - coordination of all departments and machinery or equipment, as materials must never fail.</p>	02m 03m 3m (any 1)	08
4.	Attempt any two of the following	2*8	16
a)	<p>Classification of composites: <u>Based on matrix material</u></p> <p>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.</p> <p>2) Ceramic Matrix Composites (CMC): Ceramic Matrix Composites are composed of a ceramic matrix and embedded fibers of other ceramic</p>	04 marks	08

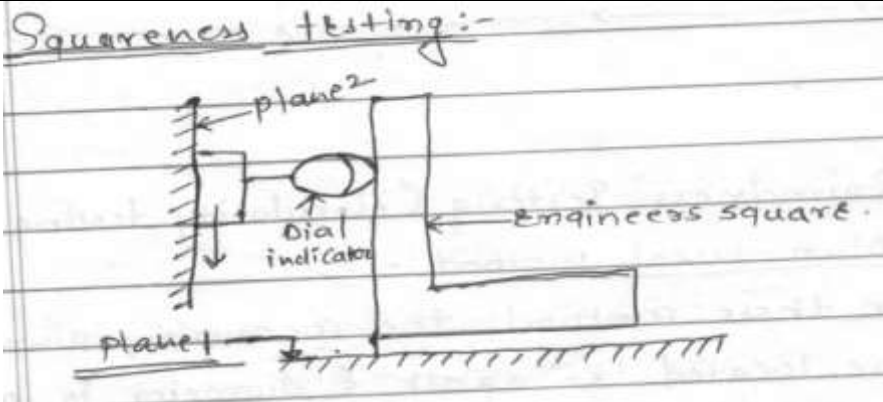
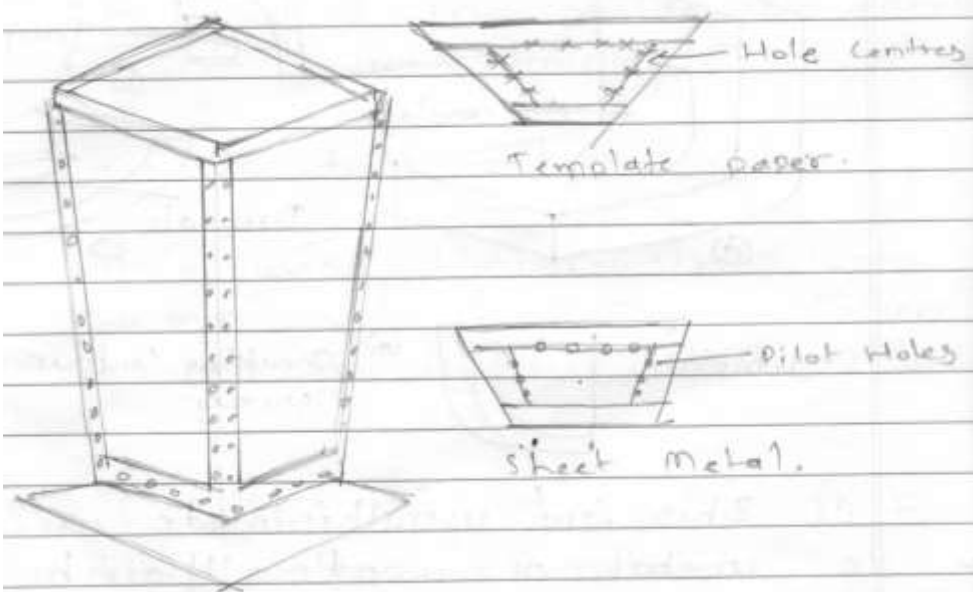


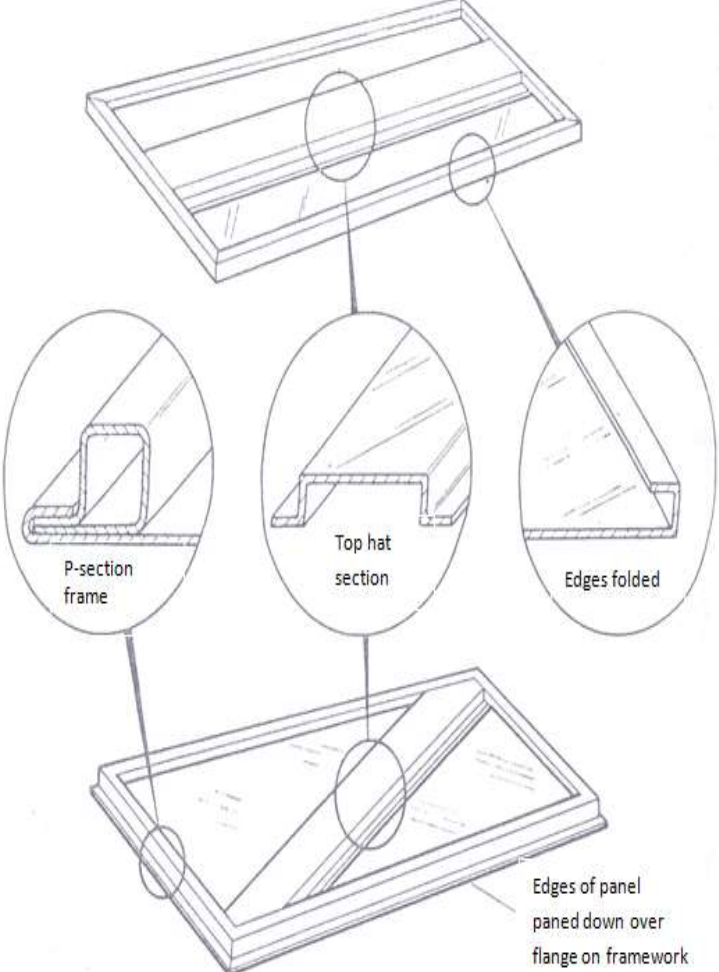
<p>material (dispersed phase).</p> <p>3) Polymer Matrix Composites (PMC): Polymer Matrix Composites are composed of a matrix from thermoset (Unsaturated Polyester (UP), Epoxy (EP)) or thermoplastic (Polycarbonate (PC), Polyvinylchloride, Nylon, Polystyrene) and embedded glass, carbon, steel or Kevlar fibers (dispersed phase).</p> <p style="text-align: center;">OR</p> <p><u>Based on reinforcing material structure</u></p> <p>1)Particulate Composites</p> <p>Particulate Composites consist of a matrix reinforced by a dispersed phase in form of particles.</p> <ol style="list-style-type: none">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. <p>2)Fibrous Composites</p> <ol style="list-style-type: none">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).<ol style="list-style-type: none">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.<ol style="list-style-type: none">1. Unidirectional orientation of fibers.2. Bidirectional orientation of fibers (woven). <p>3)Laminate Composites</p> <p>When a fiber reinforced composite consists of several layers with different fiber orientations, it is called multilayer (angle-ply) composite.</p> <p>Reinforcement & its need:-</p> <p>The role of the reinforcement in a composite material is fundamentally one of increasing the mechanical properties of the neat resin system. All of the different fibres used in composites have different properties and so affect the properties of the composite in different ways. The properties and characteristics of common fibres are explained below.</p> <p>However, individual fibres or fibre bundles can only be used on their own in a few processes such as filament winding (described later). For most other applications, the fibres need to be arranged into some form of sheet,</p>	04 m	
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		separated from the laden air. Following processing, the oils can be reused in production (recycling rate up to 80%).			
	Labor skill	Semi – skilled to skilled	Unskilled to semi - skilled		
	Cost	High cost	Low cost		
	Time	Less time	More time		
	Suitability	Large no. of jobs	As per requirement		
C ii)	<p>Essentials of plant layout: An efficient factory layout is one that can be instrumental in achieving the following objectives;</p> <ul style="list-style-type: none">a) Proper and efficient utilization of available floor spaceb) To ensure that work proceeds from one point to another point without any delayc) Provide enough production capacityd) Reduce material handling coste) Reduce hazards to personnelf) Utilize labor efficientlyg) Increase employee moraleh) Reduce accidentsi) Provide for volume and product flexibilityj) Provide ease of supervision and controlk) Provide for employee safety and healthl) Allow ease of maintenancem) Allow high machine or equipment utilizationn) Improve productivity			4m (any 4)	4

5.	Attempt any two of the following	2*8	16
a)	<p><u>Squareness testing:-</u></p>  <ul style="list-style-type: none"> ➤ When two surfaces are perfectly right angle to each other they are said to be having perfect squareness. ➤ Fig.shows the method of testing squareness with the help of engineers square and dial indicator. ➤ Squareness of the two planes 1 and 2 is checked by placing the square on plane and then checking the parallelism of second plane with the free arm of the square by sliding the dial indicator which is mounted on the 2nd plane. ➤ If the two surfaces are perfectly square, dial indicator does not show any deflection and if there is any deflection then the surface is not perfectly square to each other. 	<p>04 marks (dia.)</p> <p>04 marks</p>	08
b)	 <p>Template for Hopper Plate:</p> <ol style="list-style-type: none"> 1) Large steel hoppers are usually of riveted or welded construction made up of tapered steel plates. 2) The templates for these hoppers are made from wooden patterns, sheet metal or template paper. 	<p>04m (dia)</p> <p>4m</p>	08

	<p>3) The template is laid on the plate and outline marks with French chalk and witness mark arc center punch at a suitable position.</p> <p>4) Riveted holes are marked through the template with nipple punch when template paper is used, the holes are not provided in the paper template as in the case with wooden and metal template.</p> <p>5) The center of the hole position are marked on the paper and may be transferred on to the plate by center punching through the template.</p>		
c)	 <p>1) A large sheet metal panel may be stiffened with all four edges made rigid by folding. 'Top hat section' is used to stiffen the centre section of the panel and is usually secured in position by spot welding.</p> <p>2) Another method of stiffening large sheet metal panels is to attach them to a rigid frame-work. The welded frame is fabricated from lengths of 'P-section' which has a very high Strength/weight ratio for a sheet metal section. All four edges of the panel are folded at 90° to a suitable width. The panel is then placed in position over the frame and the edges 'paned-down' over the flange on the 'P-section'. The centre of the panel is stiffened by means of a diagonal top-hat section.</p>	<p>04 marks (for diag.)</p> <p>04 marks (expln.)</p>	08



6.	Attempt any four of the following	4*4	16
a)	<p>Factors influencing layout: While deciding his factory or unit or establishment or store, a small-scale businessman should keep the following factors in mind:</p> <p>a) Factory building: The nature and size of the building determines the floor space available for layout. While designing the special requirements, e.g. air conditioning, dust control, humidity control etc. must be kept in mind.</p> <p>b) Nature of product: Product layout is suitable for uniform products whereas process layout is more appropriate for custom-made products.</p> <p>c) Production process: In assembly line industries, product layout is better. In job order or intermittent manufacturing on the other hand, process layout is desirable.</p> <p>d) Type of machinery: General purpose machines are often arranged as per process layout while special purpose machines are arranged according to product layout.</p> <p>e) Repairs and maintenance: Machines should be so arranged that adequate space is available between them for movement of equipment and people required for repairing the machines.</p> <p>f) Human needs: Adequate arrangement should be made for cloakroom, washroom, lockers, drinking water, toilets and other employee facilities, proper provision should be made for disposal of effluents, if any.</p> <p>g) Plant environment: Heat, light, noise, ventilation and other aspects should be duly considered, e.g. paint shops and plating section should be located in another hall so that dangerous fumes can be removed through proper ventilation etc. Adequate safety arrangement should also be made. Thus, the layout should be conducive to health and safety of employees. It should ensure free and efficient flow of men and materials. Future expansion and diversification may also be considered while planning factory layout.</p>	04 marks (any four)	04
b)	<p>Dynamics of plant layout:</p> <p>Plant layout is a dynamic rather than a static concept meaning thereby if once done it 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.</p> <p>Revision in plant layout may become necessary on account of the following examples:</p> <p>a) Increase in the output of the existing product</p>	04 marks	04



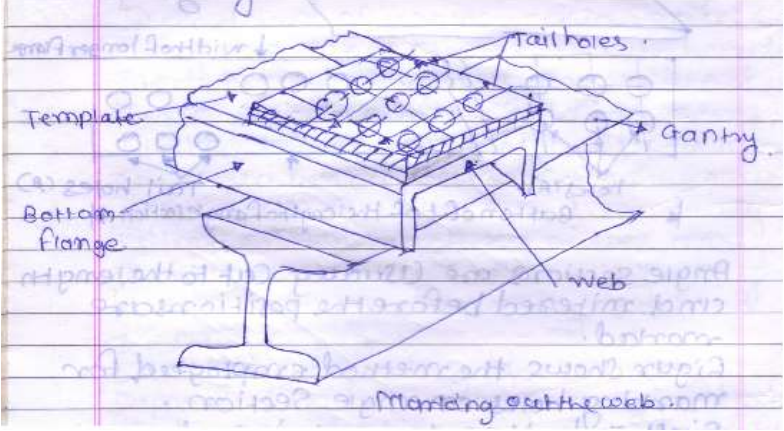
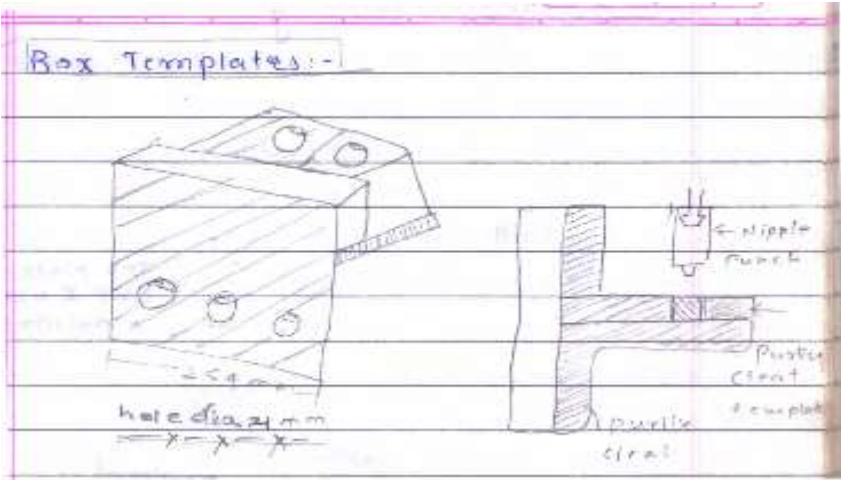
	<p>b) Introduction of a new product and diversification</p> <p>c) Technological advancements in machinery, material, processes, product design, fuel etc.</p> <p>d) Deficiencies in the layout unnoticed by the layout engineer in the beginning.</p> <p>e) Etc.</p>		
c)	<p>TEMPERATURE:-</p> <ul style="list-style-type: none">Follow the product label instructions to ensure use solution temperature is optimum for the productRefresh the solution as often as necessary to obtain peak performance. <p>TIME:-</p> <p>Follow the label instructions to determine the optimum soaking time</p> <ul style="list-style-type: none">Adjust the dwell time to match the soil load <p>PROCEDURES:-</p> <p>Follow the proper procedures to ensure optimum cleaning</p> <ul style="list-style-type: none">Post wall charts and schedule periodic in-service training sessions to ensure procedures are being followed. <p>Nature of product:-</p> <p>As the product nature changes the cleaning process is also changes.</p>	04m	04
d)	<p>Classification of methods of measurement:</p> <p>Depending upon the accuracy required and the amount of permissible error, the following methods of measurement are followed.</p> <ul style="list-style-type: none">Direct method of measurement. (Primary method) <p>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.</p> <ul style="list-style-type: none">Indirect method of measurement.(secondary Method) <p>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.</p> <ul style="list-style-type: none">Fundamental method of measurement. <p>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.</p> <ul style="list-style-type: none">Comparison method of measurement. <p>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.</p> <ul style="list-style-type: none">Substitution method of measurement. <p>In this method, the quantity to be measured is measured by direct</p>	04 m	04



	<p>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.</p> <ul style="list-style-type: none">• 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. 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		
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	<p>interconnected elements of the component which are controlled through a combined tolerance. This method is most reliable to ensure interchangeability 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.</p> <p>• Element method.</p> <p>In this method, the several related dimensions are gauged individually, i.e. each component element is checked separately.</p> <p>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.</p> <p>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.</p> <p>• Contact and contactless methods of measurements.</p> <p>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.</p> <p>In contactless method of measurements, no contact is required. Such instruments include tool-maker’s microscope and projection comparator, etc.</p>		
e)	<p>Typical information 'written-up' on templates may be as follows:</p> <ol style="list-style-type: none">1. Job or contract number,2. Size and thickness of the plate,3. Steel section and length,4. Quantity required,5. Bending or folding instructions,6. 'This side up', 'left hand' or 'right hand',7. Drilling requirements,8. Cutting instructions,9. Assembly reference mark.	04 marks (any four)	04

f)	 <p>Channel sections are cut to the required length placed on a simple gantry with the web horizontal.</p> <p>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.</p> <p>Then with the help of nipple punch we will mark the center point of each position.</p>	02 marks (dia)	04
g)	 <p>These are made from wood & simply two flanged template fastened together.</p> <p>they are used for marking up longitudinally structural member.</p> <p>The hole positions are marked on the box template to standard dimensions as per the drawing & drilled.</p> <p>Whwn marking OFF holes from a box template the nipple punch Is used.</p>	2m (dia)	4m