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18/ENG/05/026
MECHATRONICS
ENG 232 SOLUTIONS

1. A sectioned surface can be represented using **section Lines**: These are used to indicate where the cutting plane cuts the material. Section lines are thin and the symbols (type of lines) are chosen according to the material of the object. Section lines are generally drawn at a 45° angle.

2. The various principles of dimensioning are stated below
   1. All dimension, extension, and leader lines should be thin, sharp, dark lines
   2. Each dimension should be terminated by arrowheads touching the extension lines and pointing in opposite directions. Arrowheads are drawn freehand. The line should be broken only at the approximate center for the dimension figures.
   3. Dimensions shown with dimension lines and arrowheads should be placed to be read from the bottom of the drawing (unidirectional system).
   4 All dimensions should be given in decimal format
   5. A dimension line should never coincide with an object line or a center line, nor should it be an extension of these lines.
   6. Dimensions should be at least 10 mm from the object outline, then equally spaced apart. 13. Where there are several parallel dimension lines in a group, the dimension figures should be staggered so that they will not interfere with one another.
   7. Lettering (notes) should always be placed horizontal on the page, to be read from the bottom of the drawing
   POSITIVE CYLINDRICAL DIMENSION FORMS Rules:
   8. Positive cylindrical features should always be located by their center lines in the circular view of the feature.
   9. The diameter of cylindrical features should be specified in the rectangular view with a linear dimension. If clear space is available without conflict with other lines, a diameter dimension may be placed in the circular view; however, it is preferred in the rectangular view.
   10. A series of concentric diameters on the same part should be dimensioned in the view where the cylindrical surfaces show as rectangles.
   11. The dimension numeral should be preceded by the symbol Ø.
   DIMENSIONING ROUND HOLES Rules:
   12. Holes are specified by a local note and placed in the view where the hole appears as a true circle. The leader line should extend radially from the circle, touching its circumference. 20. Dimensions locating holes should be given to both of the two center lines that intersect at right angles at the hole centers, and should be placed in the view where the hole appears as a true circle. Do not give location dimensions to the edge of holes.
   13. When specifying a hole, the numerical value of the hole size (diameters) should be preceded by Ø. Symbols should be used to indicate the specific details related to the hole. See example below. A summary of the symbols follows: Notes should be written in the same sequence by which the hole would be produced.
   14. If two or more identical holes exist, one note can be used
   RADIAL DIMENSION FORMS.
   15. Radial dimensions are given for circular arcs that are less than 180°.

16. Radial dimension lines should always be placed in the circular view of the arc, and should be drawn at an angle, never horizontal or vertical.

LEADER FORMS

17. It should be an inclined straight line with a short horizontal portion extending to the mid-height of the lettering, and terminating at the other and by an arrowhead touching the feature it dimensions. The note end of the leader should extend from either the beginning of the first line, or the end of the last line of the note

18. Leaders should make a large angle (30° to 60°) with the line they touch. Leaders should never be horizontal or vertical.

19. Leader lines should never cross one another, nor should they be parallel or nearly parallel to nearby dimensions, extension, or cross-hatching lines.

20. The note portion of the leader should be outside the limits of the view, but as close as possible to the feature it dimensions.

ANGULAR DIMENSION FORMS:

21. Dimension lines for angles are drawn as arcs with their centers at the vertex of the angle dimensioned.

22. The angular dimension should be expressed in degrees (and minutes/seconds if required), and the figures should be placed horizontally.

23. Finish marks should be placed on the surface to be finished in every view where it shows as a line, even if it is hidden. The point of the V should touch the surface and point toward the solid material of the part. Where the surface is too small or too crowded to contain the mark, it may be placed on an extension line from that surface.

24. On a cylindrical surface, the mark should be placed on the rectangular projection of the surface.

GENERAL PLACEMENT RULES

25. Always dimension each feature of the object on the view where it appears in profile. The best view to use is that one in which the feature shows in its true shape and in visible lines.

26. Do not repeat dimensions on the same view or in other views.

27. Dimensioning to hidden lines should be avoided if possible (preference rule).

28 dimensions should be placed in clear spaces as close as possible to their point of application. Dimension and extension lines should plainly indicate the limits of application and the lettering should be distinct and clearly related to the proper dimension.

29. When dimensioning through crosshatching, the crosshatching should be broken around the dimension figures but not around the dimension line.

30. When a dimension figure has been changed so that it no longer agrees with the actual scaled distance on the drawing, it is customary to underline it with a wavy line or mark it NTS (not to scale).

3. A.) **Half-section** is a view of an object showing one-half of the view in section .The cutting plane in this drawing extends the distance of the radius and not along the diameter of the cylinder as in a Full Section, or when the distance is only half that of a full section.
   B.)**Full Section**: A full section is the most widely-used sectional view, If the imaginary cutting plane passes through the entire object, splitting the drawn object in two with the interior of the object revealed, this is called a "full section."

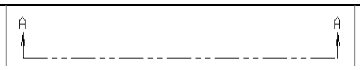
4. The British technical drawing standards give four different types of terminators to use with our leader lines.
   - Closed filled

- Closed blank
- Dot
- Tick

5. A) The scale **5:1** indicates the drawing is 5 times more than its original size(the measurement is **divided** by the scale to **reduce** the drawing in size)
   B) **1:10** indicates the drawing is 10 times less than its original size (the measurement is **multiplied** by the scale to **increase** it in size)

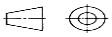
6.

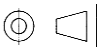
Diameter	
Radius	R
Square	
Spherical Radius	SR

Centre line	
Cutting plane line	
Long break	

7. **Orthographic projection**, common method of representing three-dimensional objects, usually by three two-dimensional drawings in each of which the object is viewed along parallel lines that are perpendicular to the plane of the drawing
   The major elements are **View(Front View,Side View and Plan View),Object and Plane**.

8. A drawing is called orthographic when the object is viewed along parallel lines that are perpendicular to the plane of the drawing

9. A) **First angle projection**: First angle projection is one of the methods used for orthographic projection drawings. In this projection method, the object is placed in the first quadrant and is positioned in front of the vertical plane and above the horizontal plane. 

   B) **Third angle Projection:** This is another perspective projection method used to represent three-dimensional objects using a series of two-dimensional views. In third angle projection, the 3D object to be projected is placed in the third quadrant and is positioned behind the vertical plane and below the horizontal plane. 

Objectives

1. To project the auxiliary view, an imaginary plane known as …….
   a) Reference Plane
   b) Principle plane
   c) Normal plane
   d) Inclined plane
2. Reference plane is parallel to the direction of view
   a) True
   b) False
3. Dimension of one side of the inclined surface can be……projected on the reference plane
   a) Indirectly
   b) Equally
   c) Directly
   d) Normally
4. In isometric projection the three edges of an object are inclined to each other at

(a) 60° (b) 120° (c) 100° (d) 90°

5. The angle between the flanks of a metric thread is

(a) 60° (b) 90° (c) 75° (d) 55°

6. Which one among the following represents a permanent fastener

a) Nut b) Rivet c) Screw d) Bolt

7. The convexity provided on the rim of the solid web cast iron pulley is called

a) Bending b) Curving c) Crowning d) Riveting

8. Section lines are generally inclined with the base, at an angle of

a) 30° b)45° c)60° d)90°

9. The isometric view of a sphere is always

a) a circle b) an ellipse c) a Parabola d) a Semicircle

10. In isometric projection, the four center method is used to construct

a) an ellipse b) a square c) a triangle d) a rectangle

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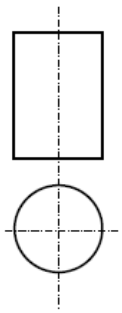
(i) With respect to the elevation and plan given below, name the solid



(a) Cone

(b) hexagonal prism

~~(c) cylinder~~

(d) hexagonal pyramid

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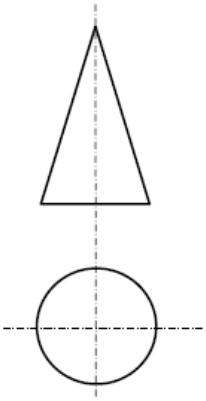
(v) With respect to the front view and top view given below, name the solid



~~(a) Cone~~

(b) Cylinder

(c) Cube

(d) Frustum

13. A footstep bearing is a

a) Journal bearing b) thrust bearing c) pivot bearing d) pedestal bearing

14. The angle between the flanks of B.S.W. thread is

a) 60° b) 65° c) 55° d)75°

15. Top view is projected on the

a) Vertical Plane b) Corner Plane c) Side Plane d) Horizontal Plane