

# ENGINEERING GRAPHICS

## UNIT- IV

### DEVELOPMENT OF SURFACES

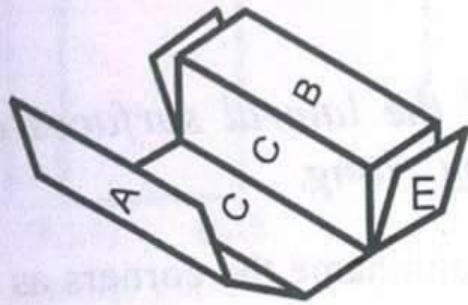
# DEVELOPMENT OF SURFACES

## **OBJECTIVE:**

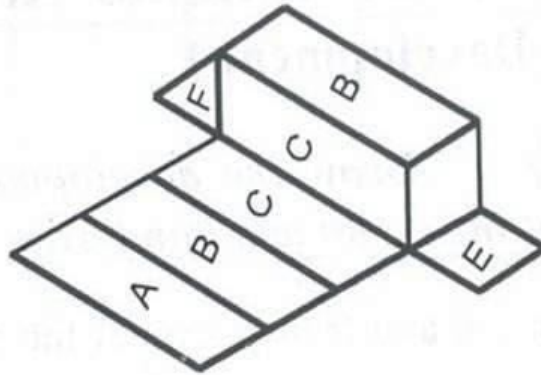
**The objective of this development of surfaces of an object has to be made to help him to go ahead with the design and manufacturing processes in the fabrication of furnaces, chimneys, boilers, automobile body building, ship building, aircraft, etc.**

# Parallel line Development

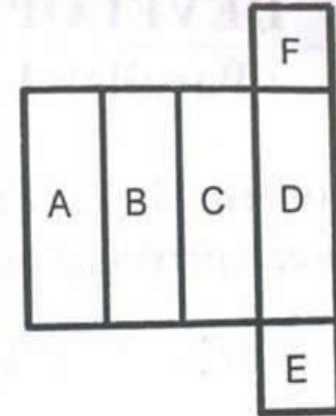
PARALLEL LINE DEVELOPMENT OF PRISM AND CYLINDER



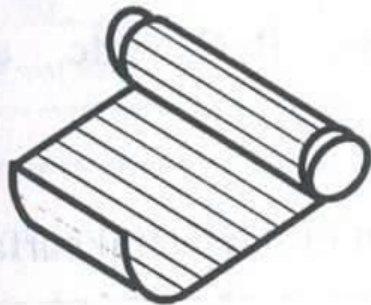
I



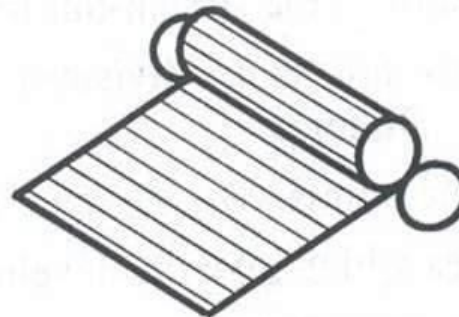
II



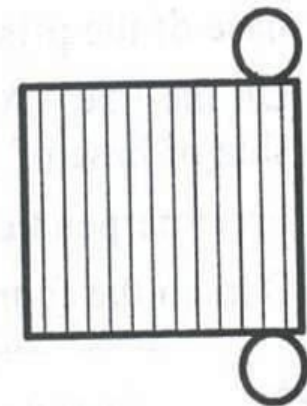
III



I



II

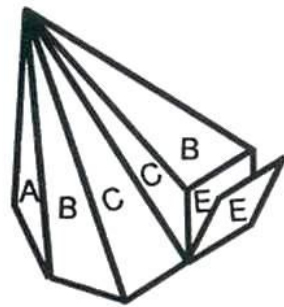


III

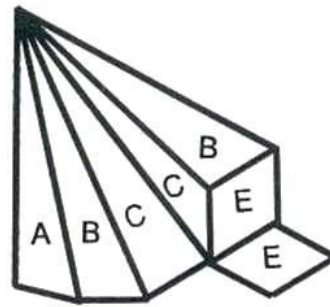
# Radial Line Development

## (ii) RADIAL LINE DEVELOPMENT OF PYRAMID AND CONE

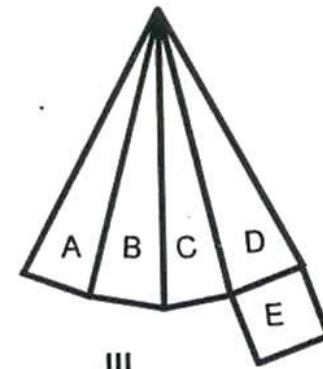
FIG.(c)  
PYRAMID



I



II

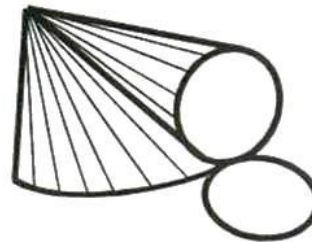


III

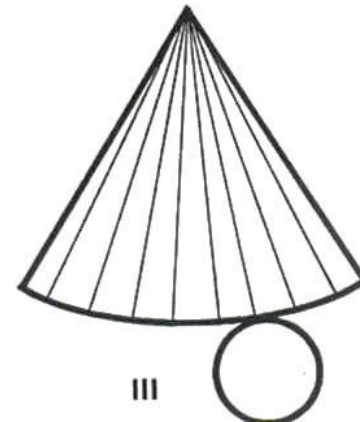
FIG.(d)  
CONE



I



II



III

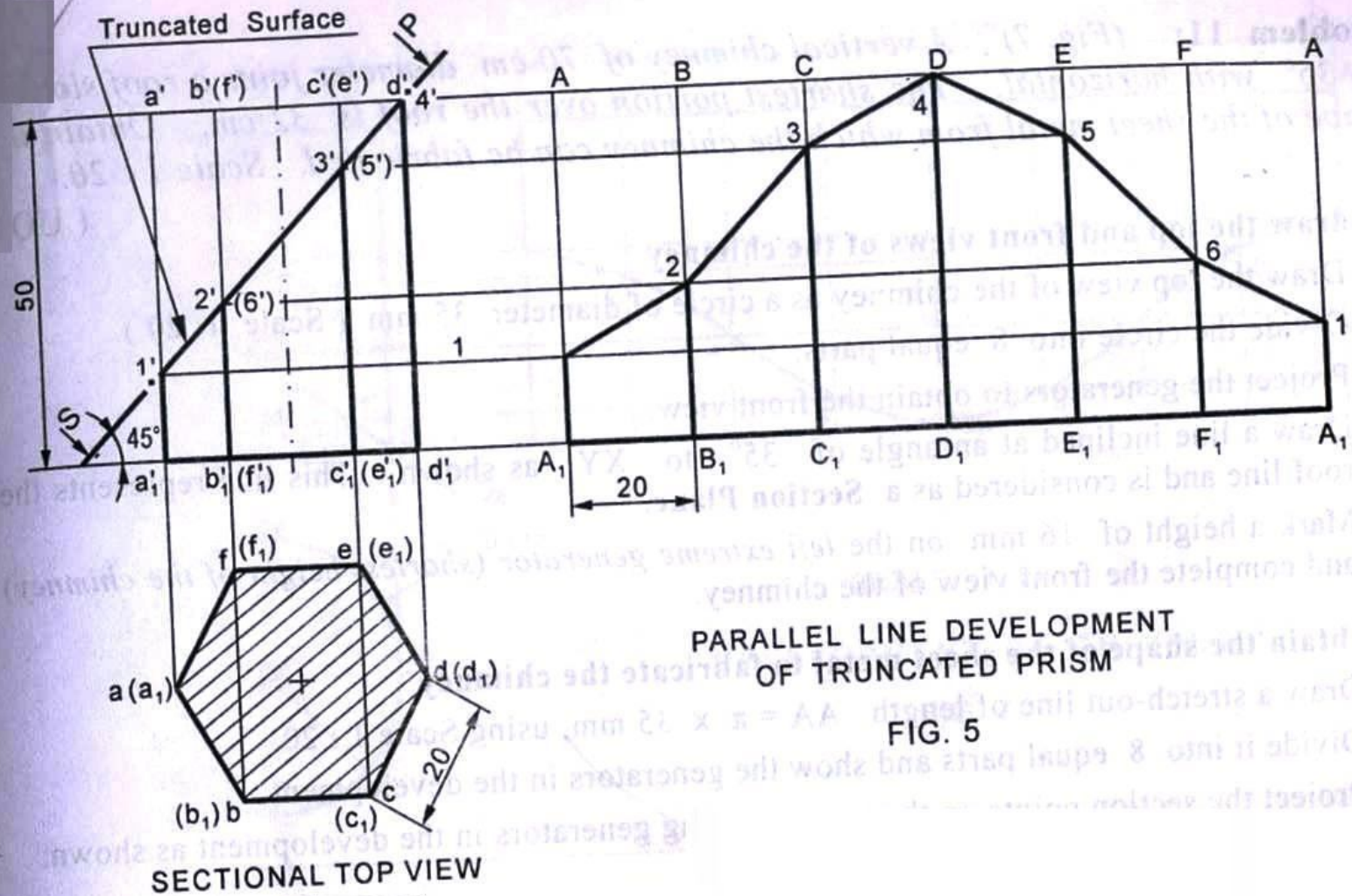
# Development of Truncated Hexagonal Prism

A hexagonal prism, edge of base 20mm and axis 50mm long, rests with its base on HP such that one of its rectangular faces is parallel to VP. It is cut by a plane perpendicular to VP, inclined at  $45^\circ$  to HP and passing through the right corner of the top face of the prism.

(i) Draw the sectional top view.

(ii) Develop the lateral surfaces of the truncated prism.

# Development of Truncated Hexagonal Prism



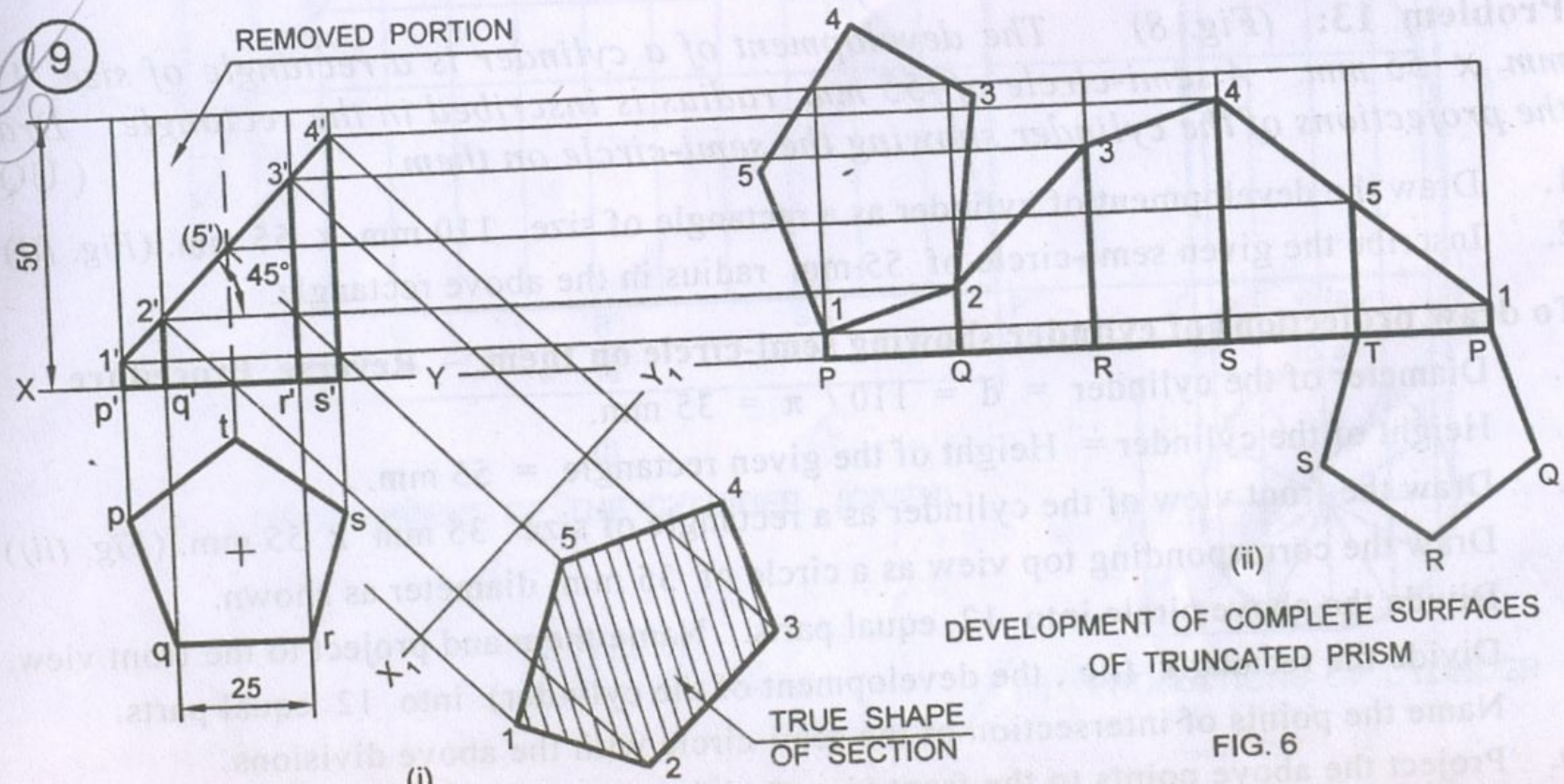
# Development of Truncated Pentagonal Prism

A pentagonal prism, side of base 25mm and altitude 50mm, rests on its base on the HP such that an edge of the base is parallel to VP and nearer to the observer. It is cut by a plane inclined at  $45^\circ$  to HP, perpendicular to VP and passing through the center of the axis.

(i) Draw the true shape of section.

(ii) Draw the development of the complete surfaces of the truncated prism.

# Development of Truncated Pentagonal Prism





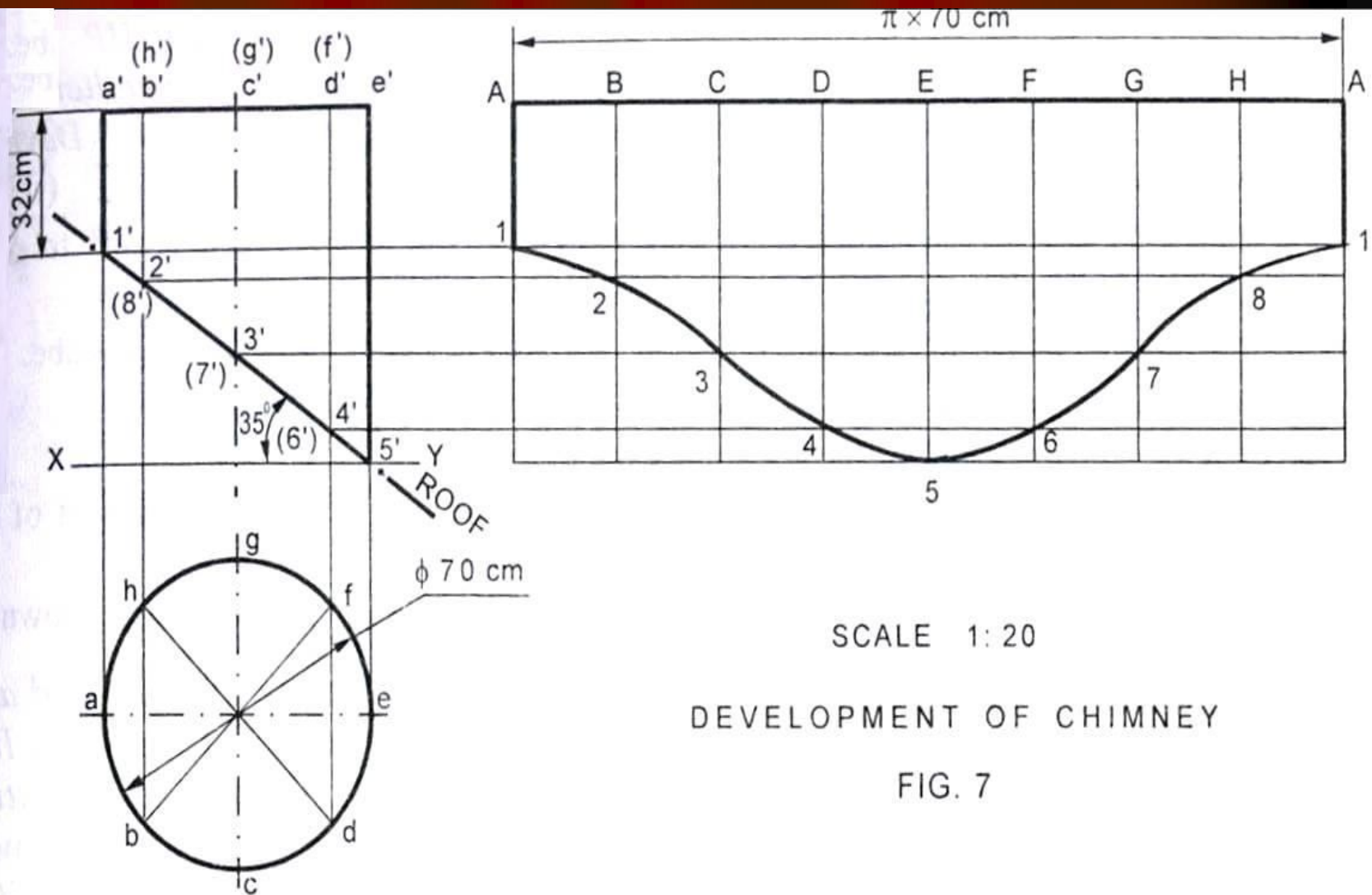
# Development of Cylinder

A vertical chimney of 70cm diameter joins a roof sloping at  $35^\circ$  with horizontal. The shortest portion over the roof is 32cm. Obtain the shape of the sheet metal from which the chimney can be fabricated.  
Scale 1:20

**Hint:**

$$70\text{cm} = 700\text{mm}/20 = 35\text{mm diameter}$$

# Development of Cylinder



SCALE 1:20

DEVELOPMENT OF CHIMNEY

FIG. 7

# Development of Cylinder

The development of a cylinder is a rectangle of size  $110\text{mm} \times 55\text{mm}$  radius is inscribed in the rectangle. Draw the projections of the cylinder showing the semi-circle on them.

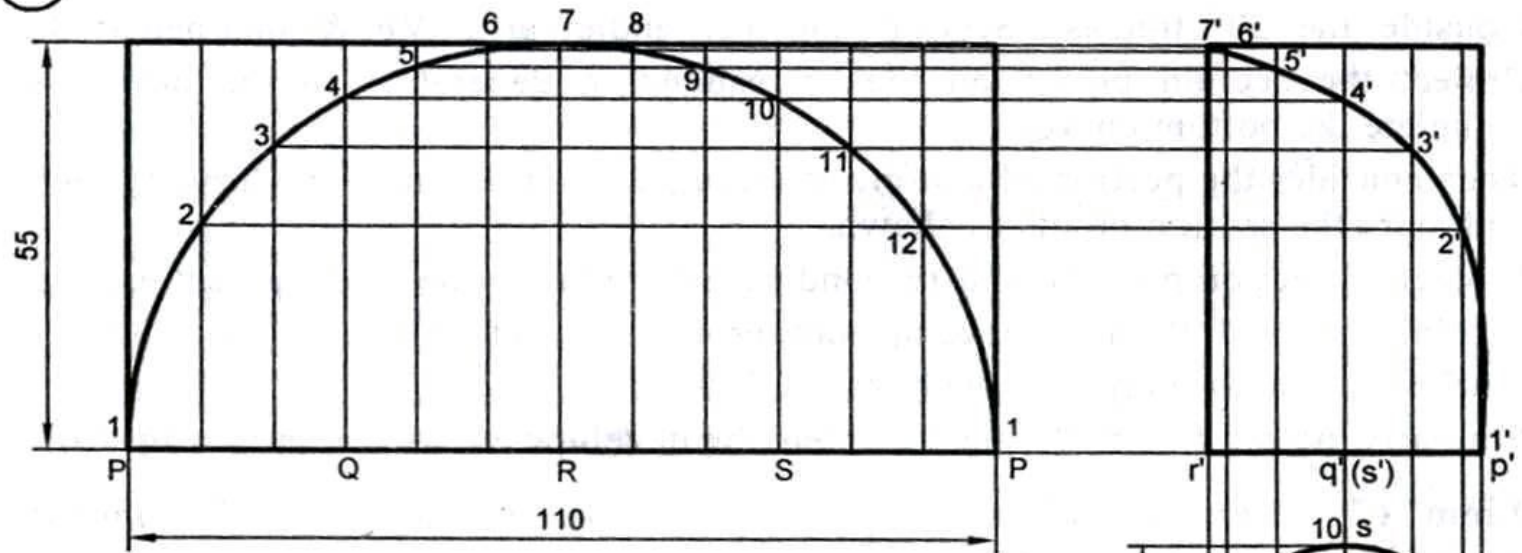
1. Draw the development of cylinder as a rectangle of size  $110\text{mm} \times 55\text{mm}$ .
2. Inscribe the given semi-circle of  $55\text{mm}$  radius in the above rectangle.

Hint:

$$\text{Diameter of the cylinder} = d = 110/\pi$$

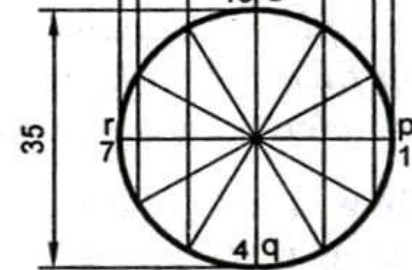
# Development of Cylinder

13



(i)  
DEVELOPMENT OF THE CYLINDER (GIVEN)

FIG. 8

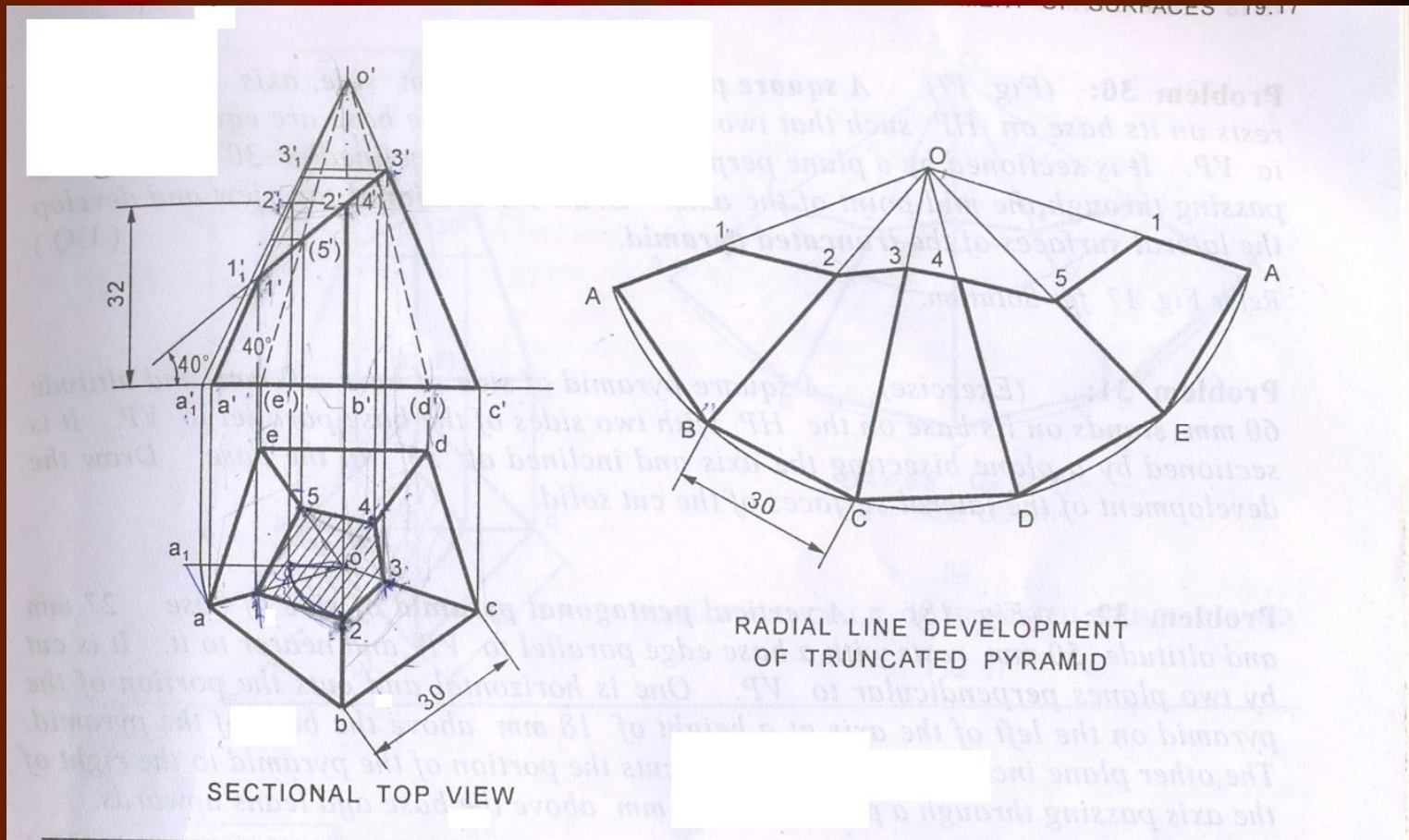


(ii) PROJECTIONS OF CYLINDER

# Development of Truncated Pentagonal Pyramid

A pentagonal pyramid, side of base 30mm and height 52mm, stands with its base on HP and an edge of the base is parallel to VP and nearer to It. It is cut by a plane perpendicular to VP, inclined at  $40^\circ$  to HP and passing through a point on the axis, 32mm above the base. Draw the sectional top view. Develop the lateral surfaces of the truncated pyramid.

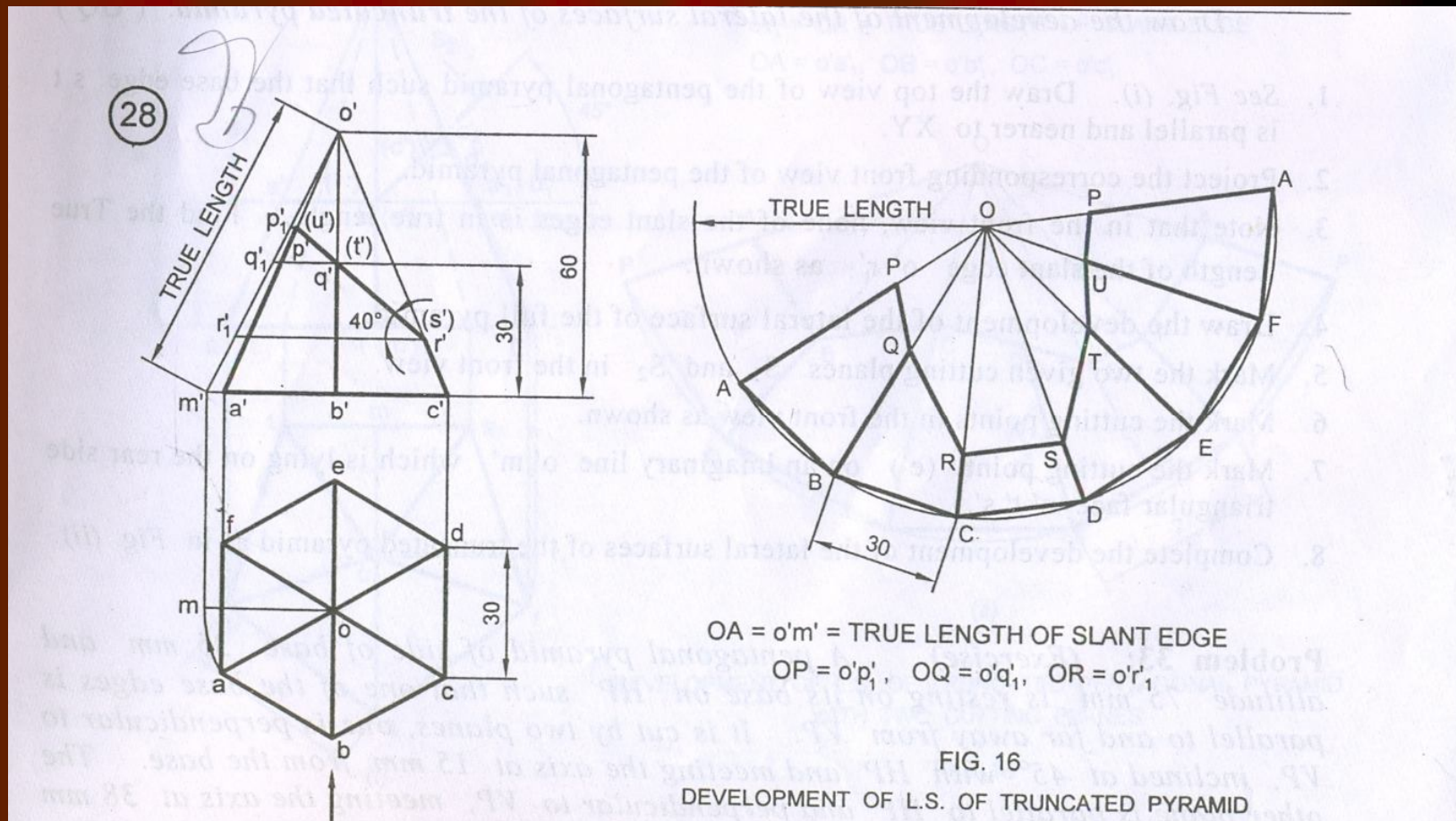
# Development of Truncated Pentagonal Pyramid



# Development of Truncated Hexagonal Pyramid

A regular **hexagonal pyramid** of side of base 30mm and height 60mm is resting vertically on its base on HP such that two of the sides of the base are perpendicular to VP. It is cut by a plane inclined at  $40^\circ$  to HP and perpendicular to VP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surfaces of the **truncated pyramid**.

# Development of Truncated Hexagonal Pyramid





# Development of Truncated Cone

A cone of base 50mm diameter and height 65mm rests with its base on HP. A section plane perpendicular to VP and inclined at  $30^\circ$  to HP bisects the axis of the cone. Draw the development of its lateral surface. (UQ)

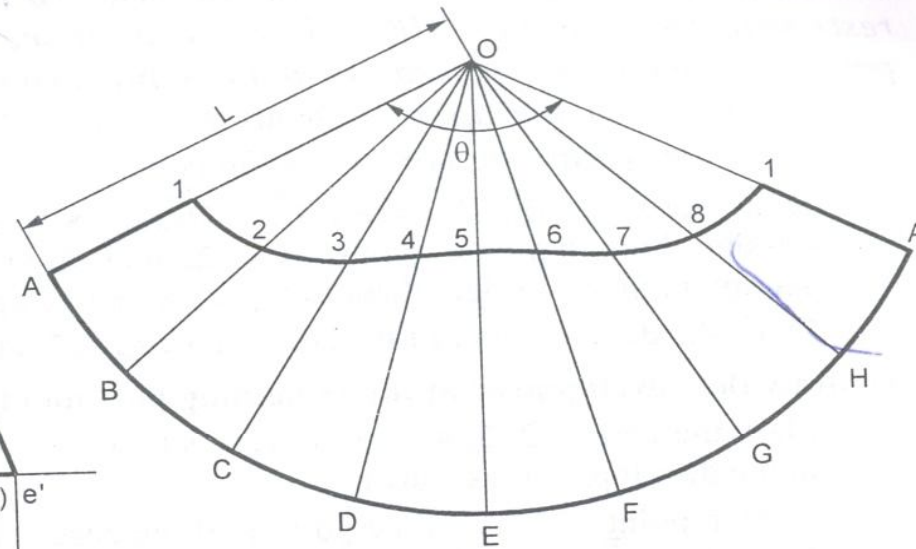
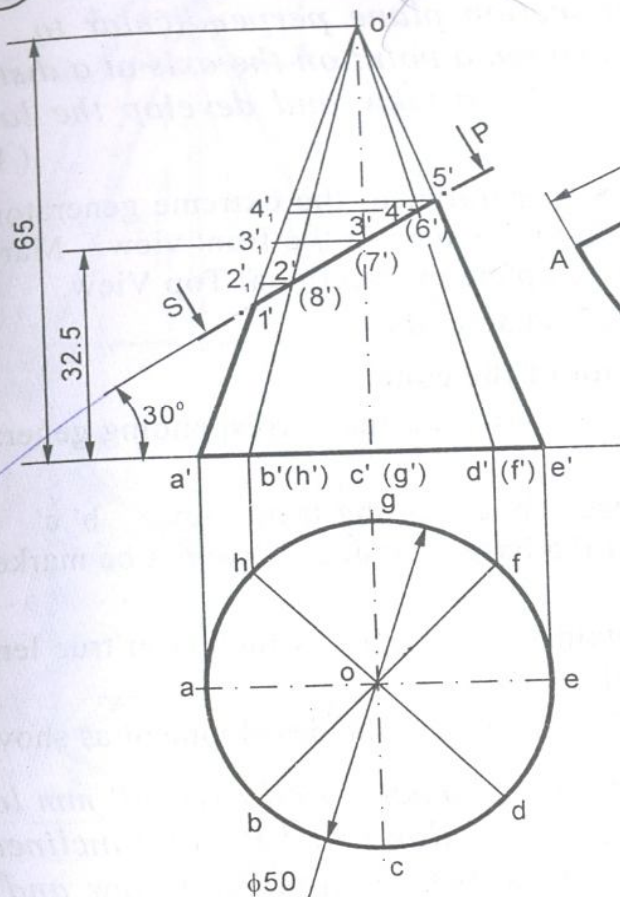
Hint:

$$\theta = 360^\circ \times r/L$$

( $r$  = radius of base circle,  $L$  = True length)

# Development of Truncated Cone

49



$o'a' = OA = L = \text{TRUE LENGTH OF THE GENERATOR}$

RADIAL DEVELOPMENT OF TRUNCATED CONE

FIG. 27

# DEVELOPMENT OF SURFACES OF SOLIDS WITH CUTOUTS

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

# Development of Surfaces of cube with Cylindrical cut-out

A **cube** of 40mm edge stands on one of its faces on HP with a vertical face making  $45^\circ$  to VP. A horizontal cylindrical hole of 30mm diameter is drilled centrally through the cube such that the hole passes through the opposite vertical edges of the cube.

Draw the development of lateral surface of the cube having the hole. (UQ)

## Development of Surfaces of rectangular prism with cylindrical cut-out

A **rectangular prism** of sides of base  $50\text{mm} \times 40\text{mm}$  and height  $80\text{mm}$  rests on its base on HP such that its vertical faces are equally inclined to VP. It has a horizontal hole of  $40\text{mm}$  diameter drilled through the geometrical center of the prism. The axis of the hole is perpendicular to the axis of the prism. Develop the lateral surfaces of the prism having the hole on it. (UQ)

# Development of Surfaces with Cylindrical cut-outs

A **square prism** of side of base 45mm and axis 80mm long stands on its base on HP with a vertical face parallel to VP. A **circular cutout** of 34mm diameter is drilled through the prism. The center of the cutout is 40mm above the base and is 15mm off- set from the axis of the prism. Draw the development of the lateral surfaces of the solid. (UQ)

# Development of Surfaces with Cylindrical cut-outs

A **cylinder** of base diameter 64mm and axis length 80mm is resting on HP on its base. A hole of 60mm diameter is drilled on the surface of the cylinder. The axis of the hole intersects with the axis of the cylinder at right angles and bisects the axis of the cylinder. Draw the development of the lateral surface of the cylinder with the hole. (UQ)

# Development of Surfaces with Cylindrical cut-outs

A **cylinder** of base diameter 50mm and axis length 70mm is resting on HP on its. A cylindrical hole of 40mm diameter is drilled on the surface of the cylinder. The axis of the hole intersects with the axis of the cylinder at right angles and bisects, the axis of this cylinder. Draw the development of the lateral surface of the cylinder.



# HEXAGONAL PYRAMIDS WITH CYLINDRICAL CUTOUTS

A **hexagonal pyramid** of side of base 24mm and altitude 56mm rests with its base on HP with an edge of the base parallel to VP. A through Circular hole of 24mm diameter is drilled in the pyramid such that the axis of the hole is perpendicular to VP and cuts the axis of the pyramid with the true shape of the hole cut in it. (UQ)

# PENTAGONAL PYRAMIDS WITH CYLINDRICAL CUTOUTS

A right regular **pentagonal pyramid** of base edge 24mm and axis 60mm long rests on its base on HP with a base edge parallel to VP and away from the observer. A hole of 20mm diameter is drilled right through the pyramid with the axis of the hole perpendicular to VP and intersecting the axis of the pyramid at 20mm above the base. Develop the lateral surfaces of the pyramid with the hole formed on it. (UQ)

END