5.0 Projection of Solids (Manual Drawing)

SEMESTER: I/II

COURSE TITLE: **COMPUTER AIDED ENGINEERING GRAPHICS**

COURSE CODE: **22MED13/23**

Solution Manual

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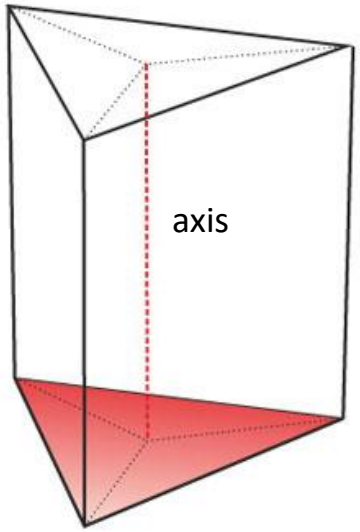
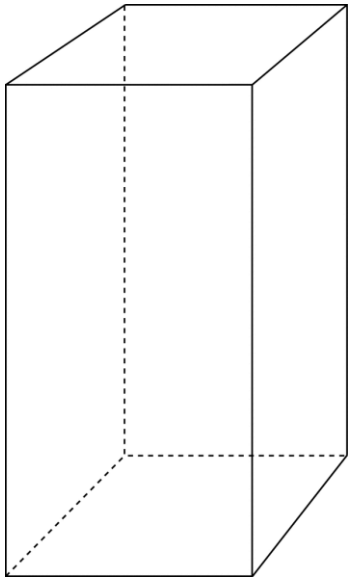
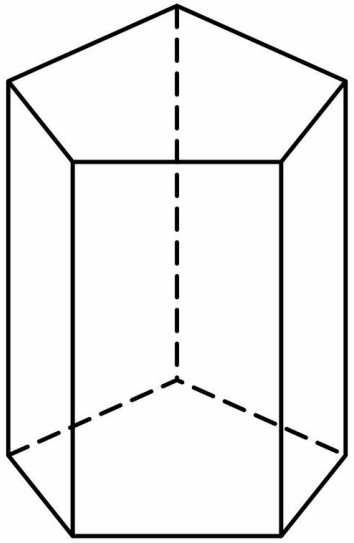
PRISMS



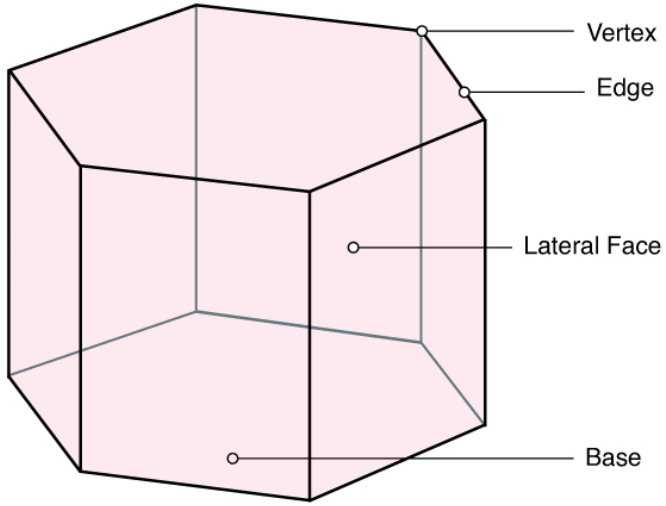
Triangular Prism



Square Prism



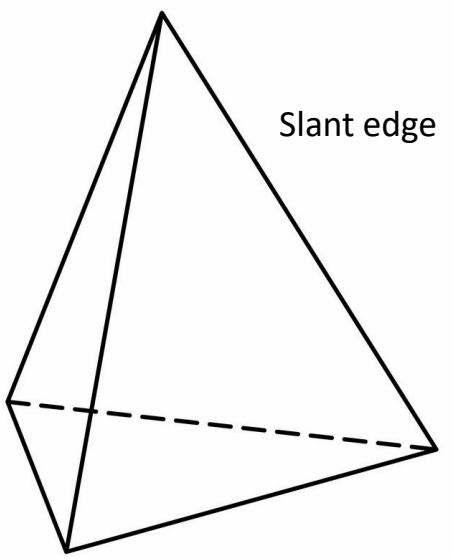
Pentagonal Prism



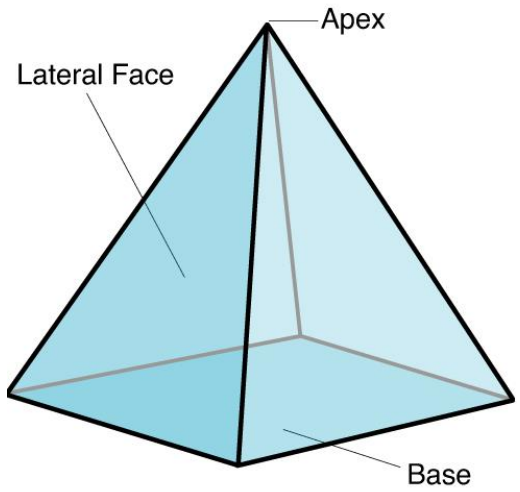
Hexagonal Prism

- A prism will have top & bottom faces as regular polygons and lateral faces as **rectangles**.
- The number of **rectangular faces** will be equal to the **number of sides** of the top (or bottom) face.
- The edges of the lateral faces are called **longer edges**.
- An imaginary line joining the center of top face to center of bottom face is known as **axis** of the prism, which will be perpendicular to the top and bottom faces.
- A prism may be resting on HP on one of its faces, base edge, longer edge, corner or a rectangular face.

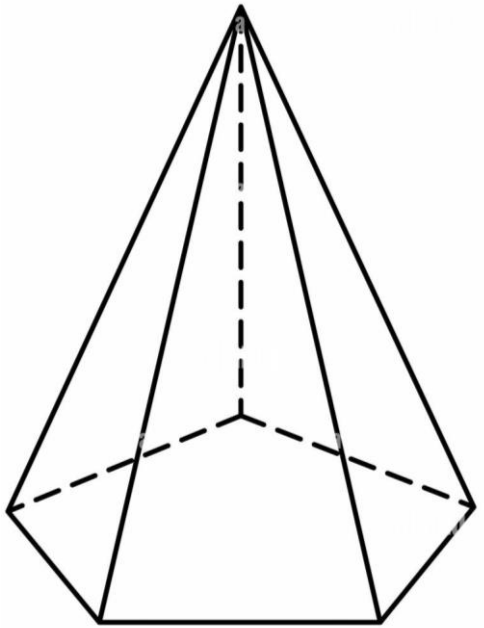
PYRAMIDS



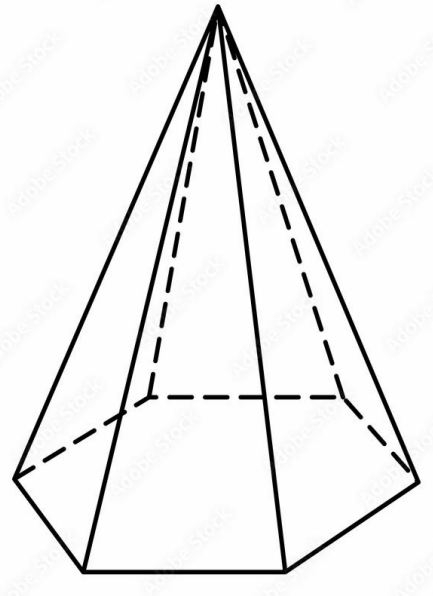
Triangular Pyramid



Square Pyramid

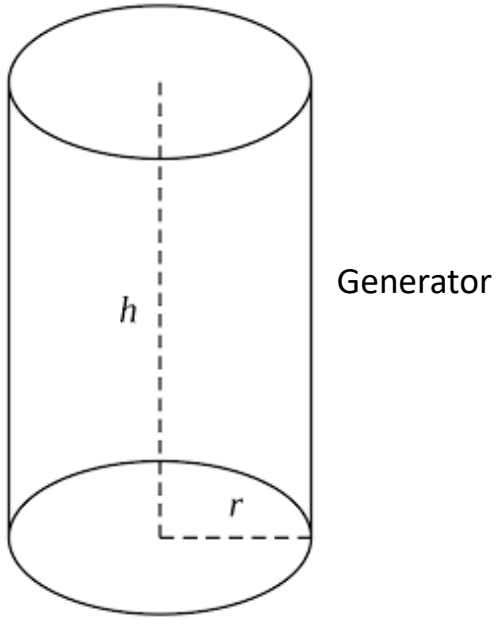


Pentagonal Pyramid

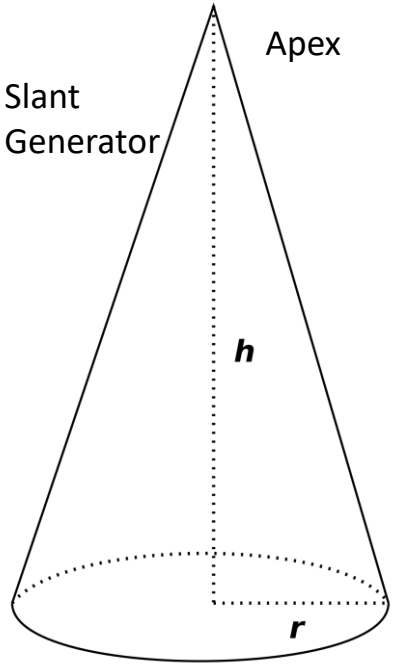


Hexagonal pyramid

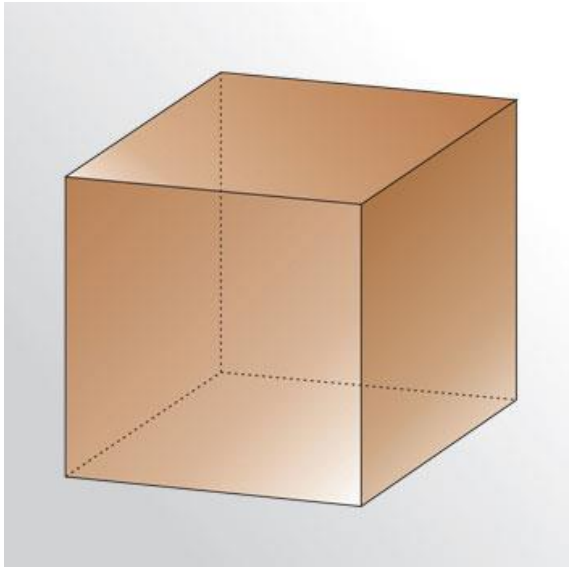
- A pyramid will have bottom face as regular polygons and lateral faces as **isosceles triangles.**
- The number of **triangular faces** will be equal to the **number of sides** of the bottom face.
- The edges of the lateral faces are called **slant edges**. All the slant edges converge at the **apex** of the pyramid.
- An imaginary line joining the apex to center of bottom face is known as **axis** of the pyramid, which will be perpendicular to the bottom face.
- A pyramid may be resting on HP on its base, base edge, slant edge, corner or a triangular face.



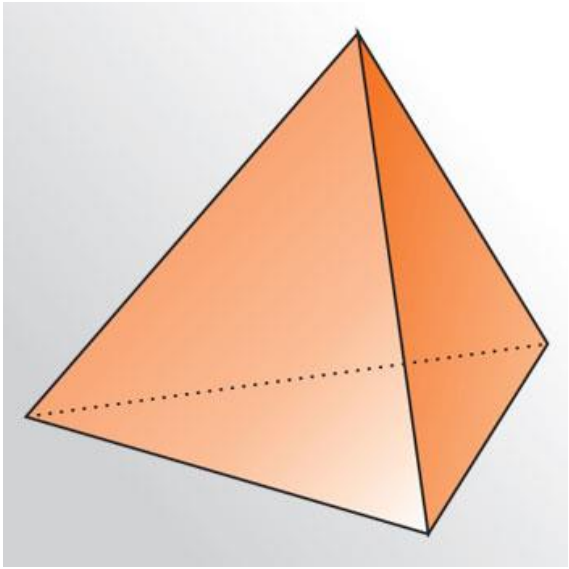
Cylinder



Cone



Hexahedron or cube



Tetrahedron

- A **Cylinder** will have top & bottom faces as circles and lateral faces curved. The lateral surface may be assumed to be made of infinite number of vertical lines known as **generators**.
- A **Cone** will have an apex and curved lateral surface which can be assumed to be made of infinite number of **slant generators**.
- A **hexahedron (or cube)** is a prismatic solid with **six identical square faces**. [Not in our syllabus]
- A tetrahedron is a pyramid type solid which has **four identical equilateral triangular faces.** [Not in our syllabus]

5.1 A square prism of base sides 30mm and 60mm axis length rests on HP on one of its base edges which is inclined at 30^0 to VP. Draw its projections when the axis is inclined at 45^0 to HP.

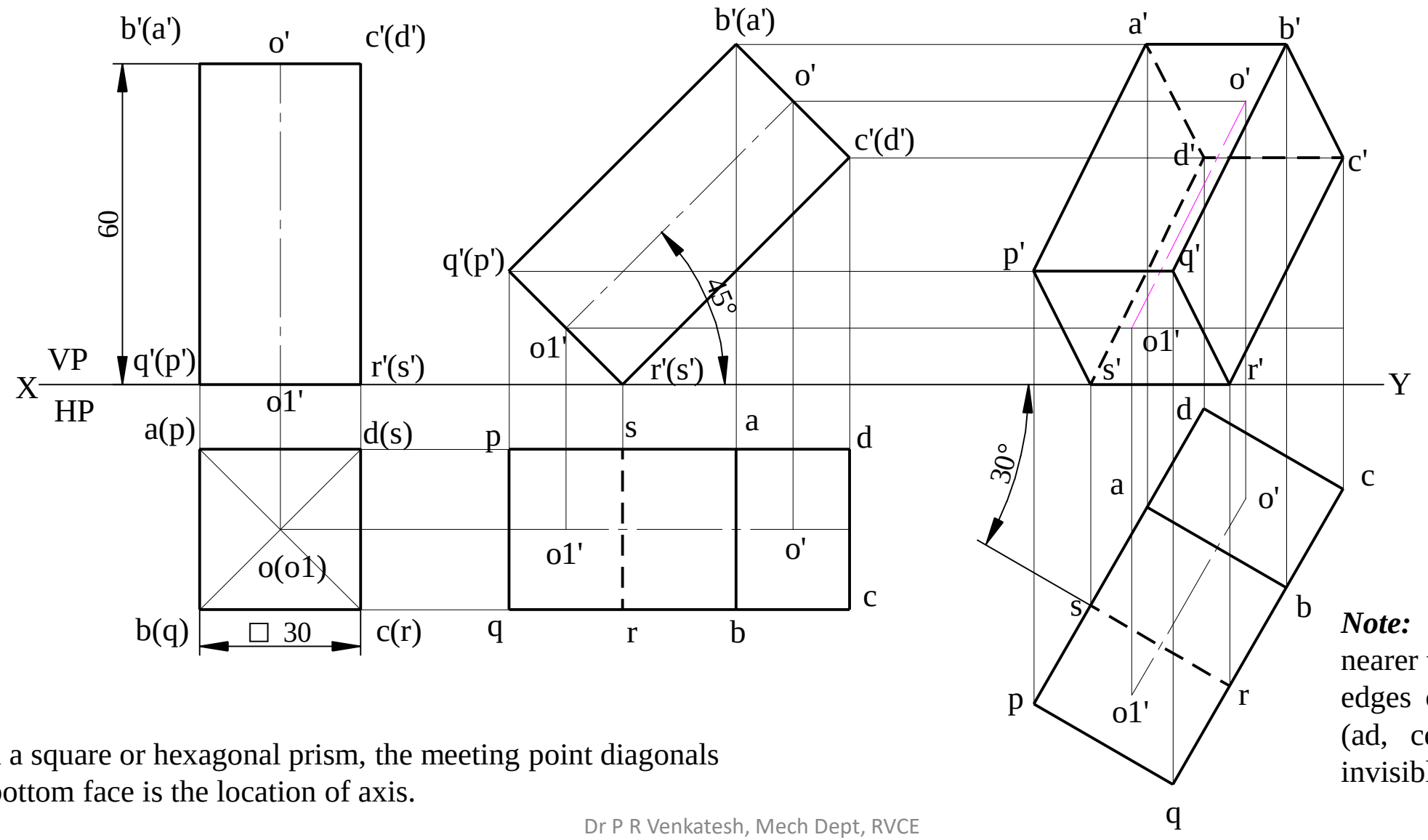
Solution:

1. As the prism is resting on one of its base edges, and the axis is inclined to HP, make the initial position in the top view with an edge of base perpendicular to XY line (VP).
2. In the second position, redraw the front view of the prism about the base edge such that the base of the prism is inclined at (90^0 -Inclination of the axis) = (90-45)=45^0 to the XY line.
3. Draw the top view of the prism and mark the invisible edge (Resting edge) by dotted line.
4. As it is stated that the resting edge which is in HP must be 30^0 to VP , redraw the top view such that the edge on HP is 30^0 to XY line.
5. Draw the final front view of the solid, by joining the edge or corner which is away from observer (nearer to VP) by dotted lines.

Note:

- **As the axis of a solid is perpendicular to the base, the inclination of the base will be = (90^0 -Inclination of the axis)**
- **The edges/corner away from the observer will be invisible and hence must be shown by dotted lines.**
- **No two dotted lines or No two full lines can cross each other in any view.**

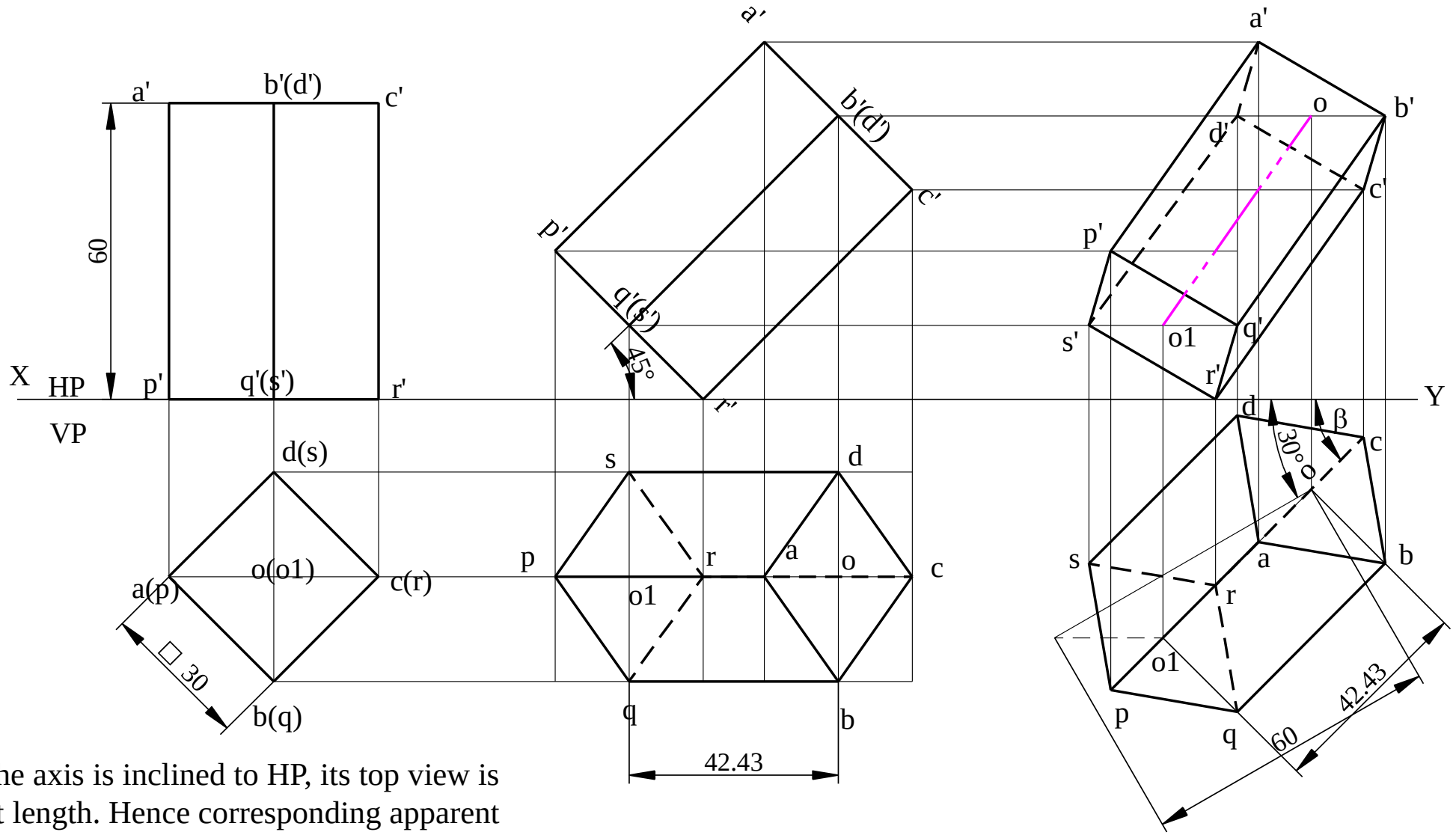
5.1 A square prism of base sides 30mm and 60mm axis length rests on HP on one of its base edges which is inclined at 30^0 to VP. Draw its projections when the axis is inclined at 45^0 to HP.



Note: In a square or hexagonal prism, the meeting point diagonals of top/ bottom face is the location of axis.

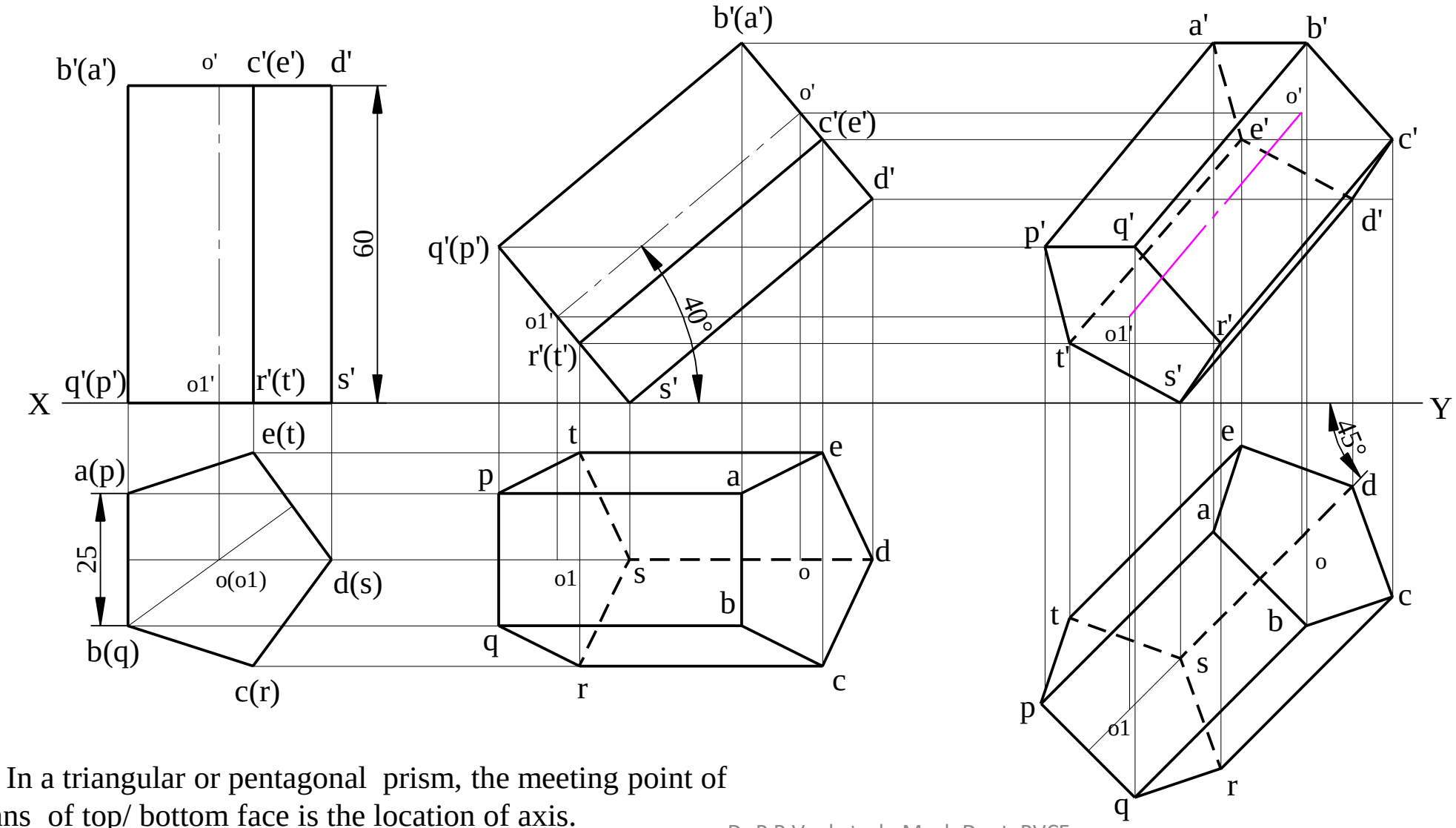
Note: The point d is nearer to VP, hence the edges connecting to d (ad, cd & ds) are invisible in front view

5.2 A square prism of base sides 30mm and 60mm axis length rests on HP on one of its base corners in such a way that the axis is inclined at 45^0 to HP. Draw its projections when the axis is inclined at 30^0 to VP.



Note: As the axis is inclined to HP, its top view is in apparent length. Hence corresponding apparent angle with VP is to be found.

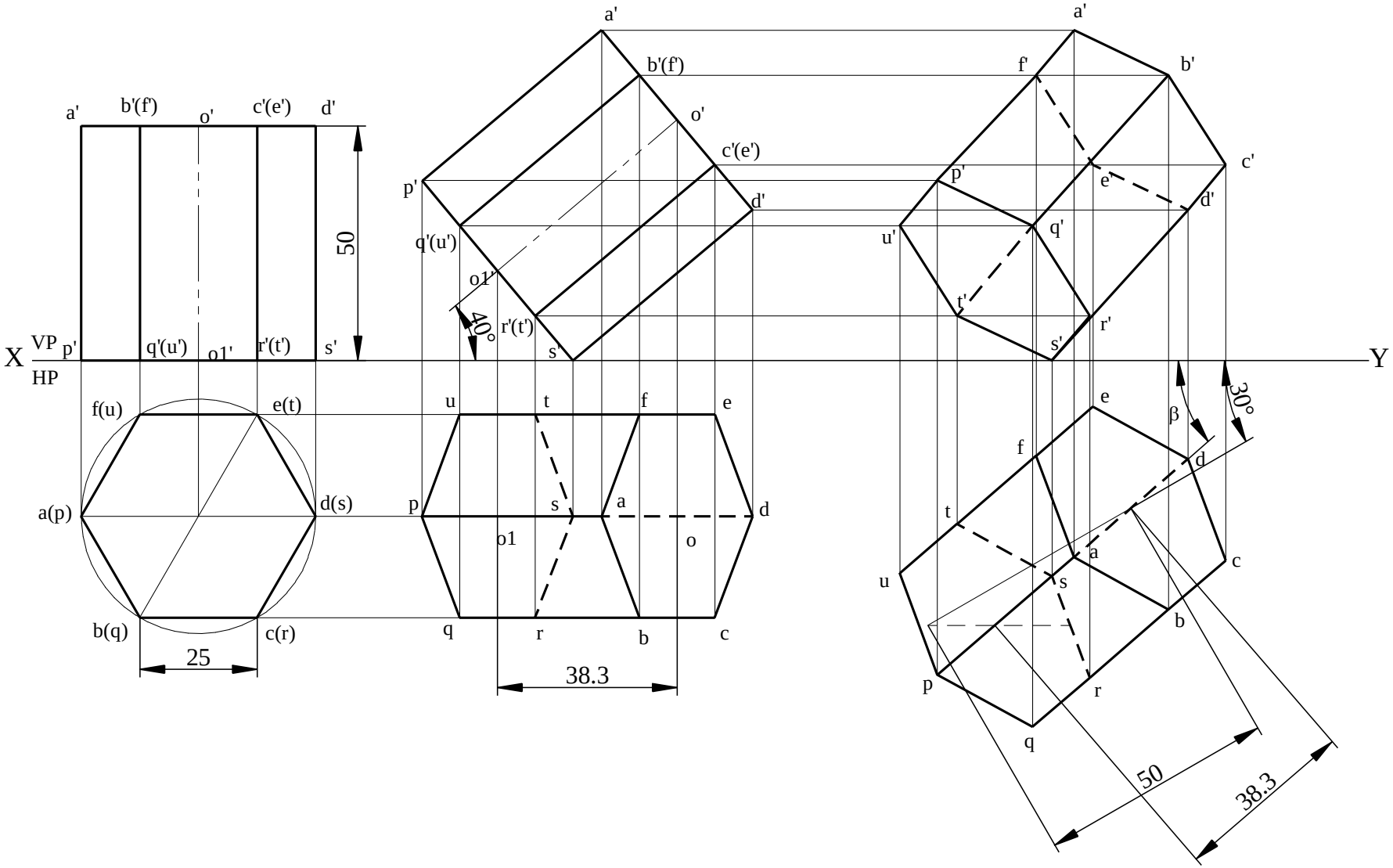
5.3 A pentagonal prism of base sides 25mm and 60mm axis length rests on HP on one of its base corners such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections when the axis is inclined at 40^0 to HP and appears to be inclined at 45^0 to XY line.



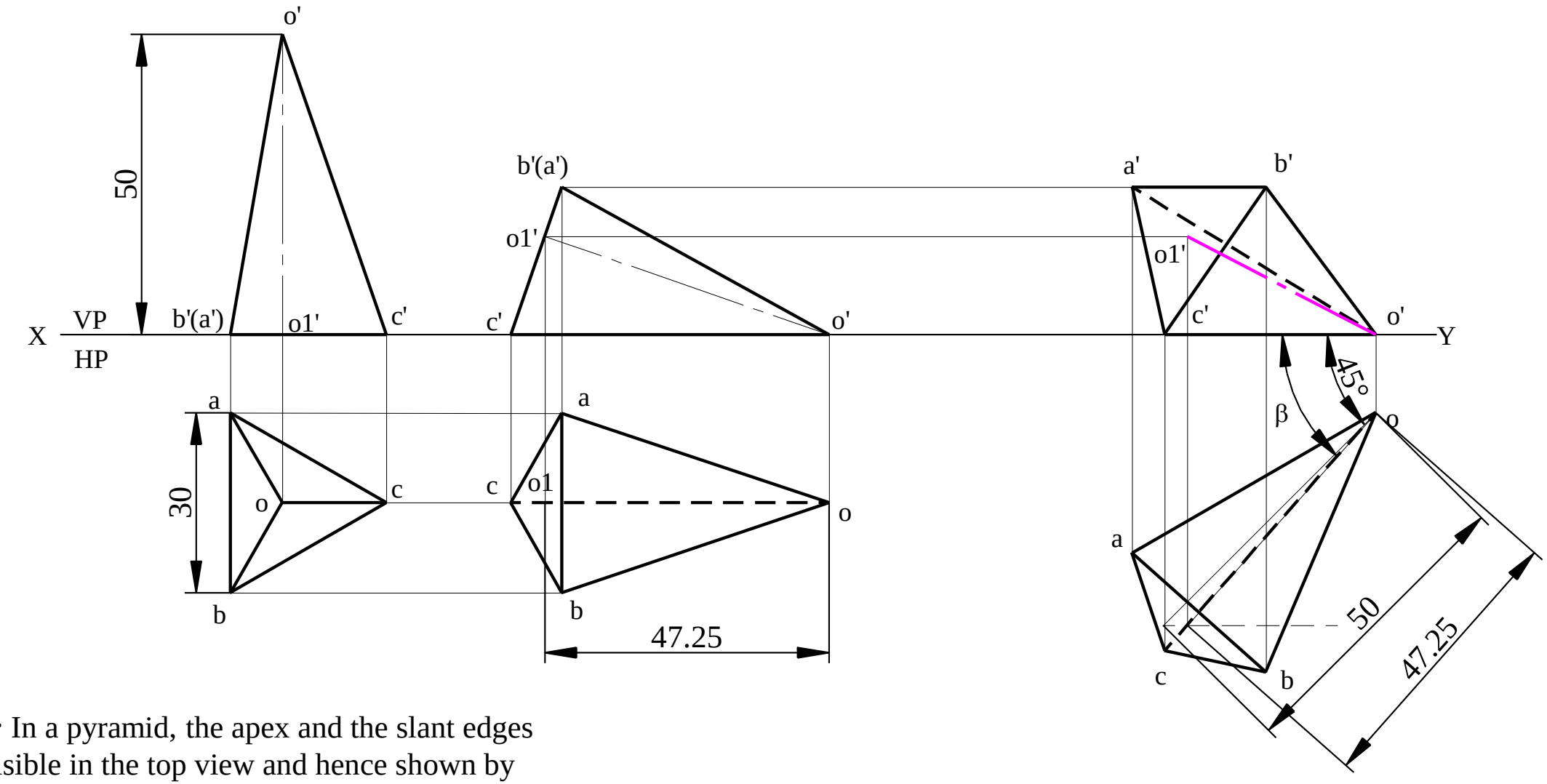
Note: In a triangular or pentagonal prism, the meeting point of medians of top/ bottom face is the location of axis.

Note: As it is given that the axis appears to be VP at 45 deg, it is the apparent angle itself.

5.4 A hexagonal prism of base sides 25mm and 50mm axis length rests on HP on one of its base corners such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections when the axis is inclined at 40^0 to HP and 30^0 to VP.

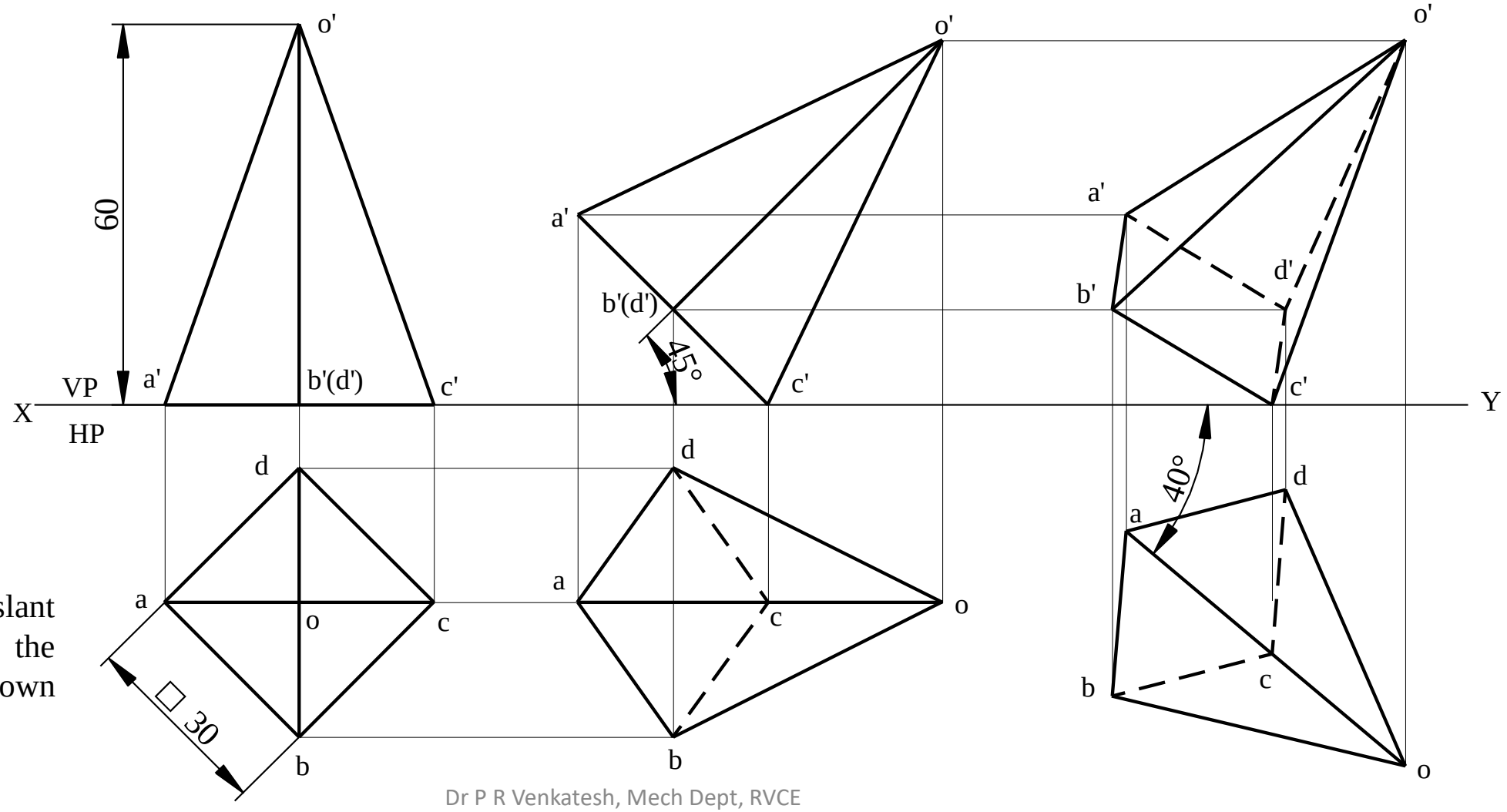


5.5 A triangular pyramid 30mm base edges and 50mm axis length rests on HP on one of its slant edges. Draw the projection of the pyramid when the axis is inclined to VP at 45^0.



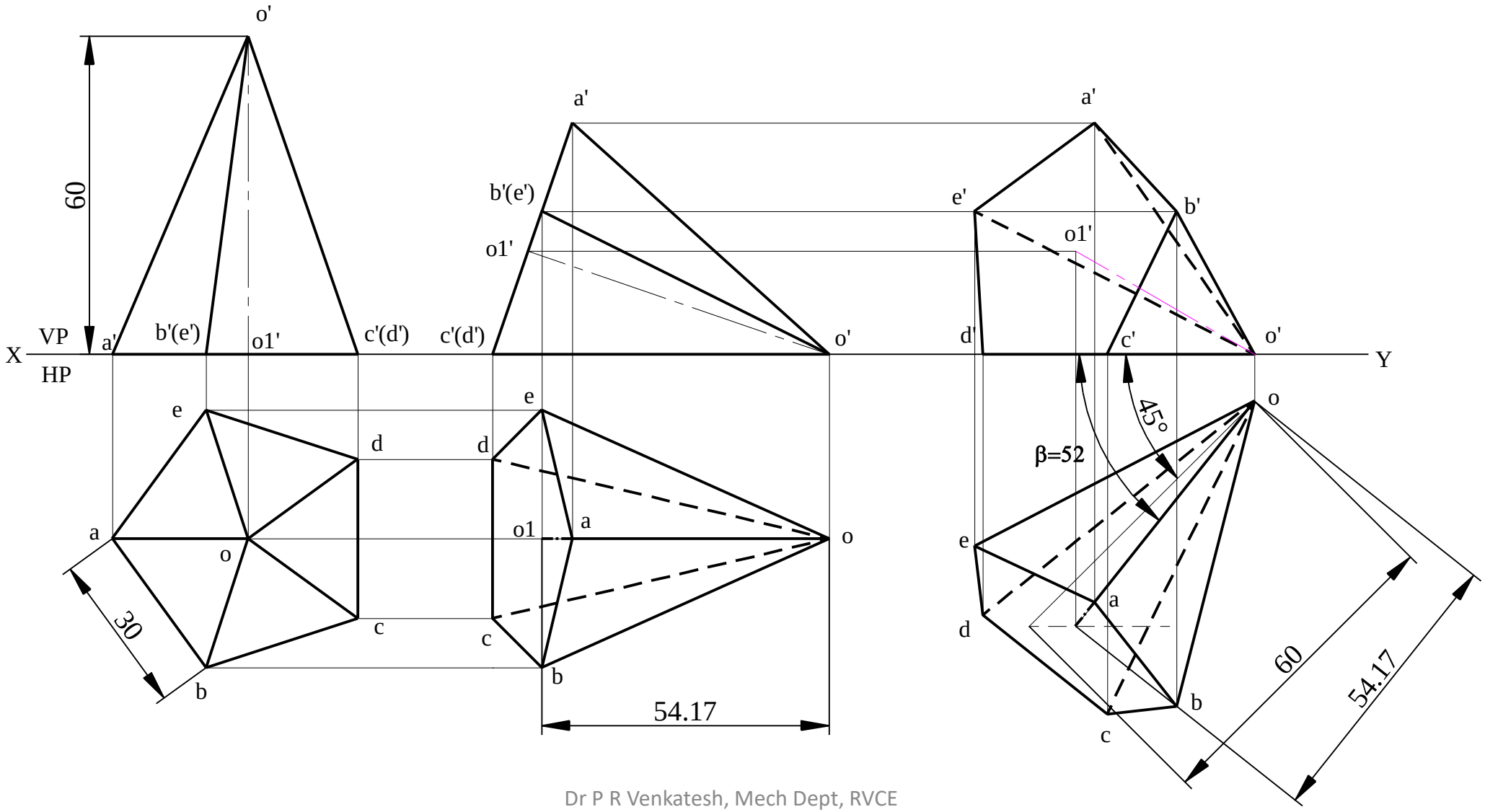
Note: In a pyramid, the apex and the slant edges are visible in the top view and hence shown by thick lines.

5.6 A square pyramid 30mm base edge and 60mm axis length rests on HP on one of its base corners such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections when the axis is inclined at 45^0 HP and top view of the axis makes 40^0 to XY line when the apex is nearer to the observer.

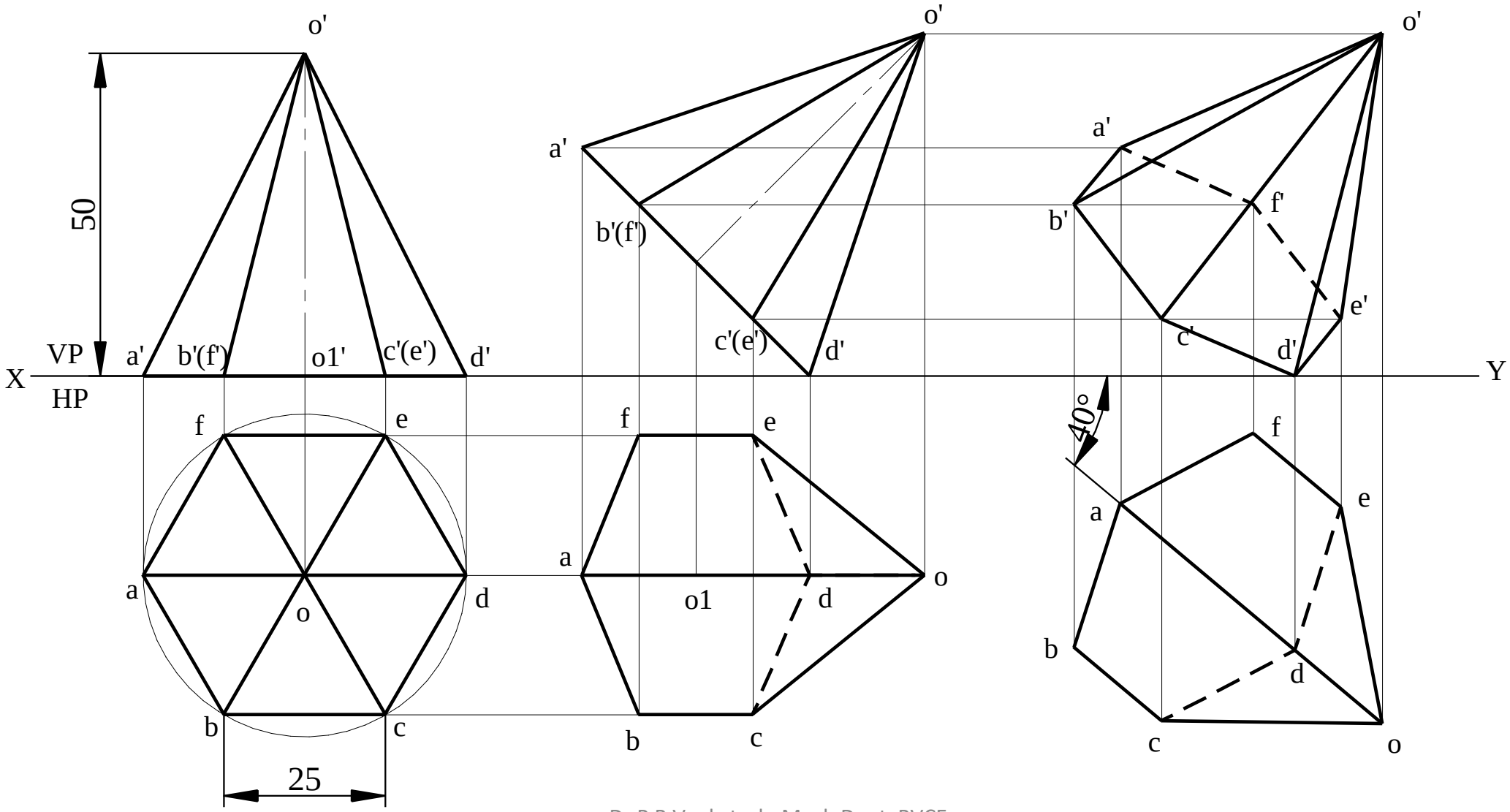


Note: Here, a visible slant edge (o'b') is ahead of the axis, hence axis is not shown in front view.

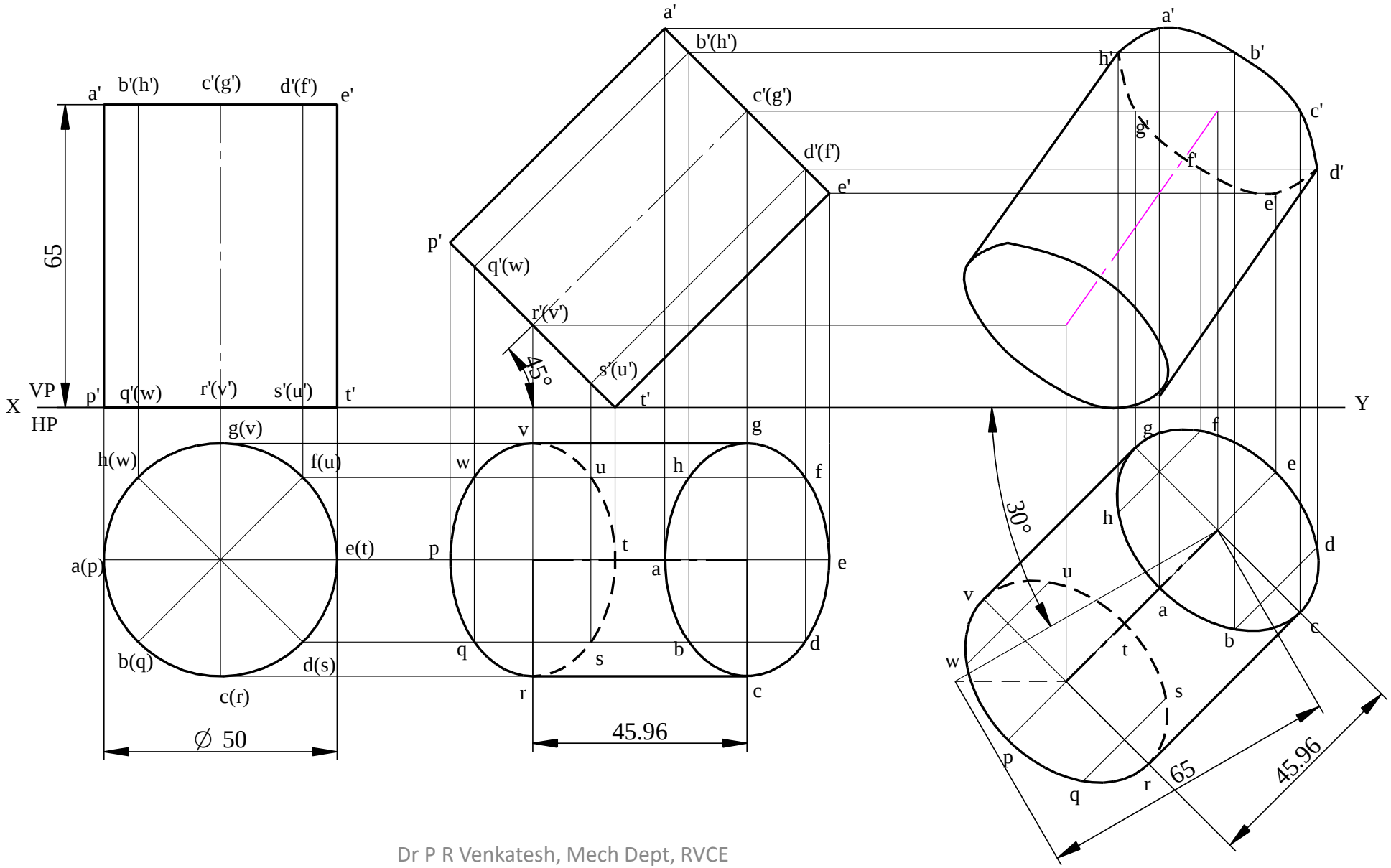
5.7 A pentagonal pyramid 30mm base edges and 60mm axis length rests on HP on one of its triangular faces. Draw the projections of the pyramid when the axis is inclined to VP at 45^0 and the base is nearer to the observer.



5.8 A hexagonal pyramid of base edge 25mm and height 50mm rests on HP on one of its base corners such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections when the axis is inclined at 45^0 to HP and top view of the axis makes 40^0 to XY line when the apex is nearer to the observer.



5.9 A cylinder of base circle diameter of 50mm and 65mm axis length rests on HP on one of its base point on HP with its axis inclined at 45^0 to HP and top view of the axis is inclined at 30^0 to VP. Draw the projections.



5.10 A cone of base circle diameter of 50mm and 65mm axis length is resting on a base point on HP. Base makes 30^0 to HP. Draw the projection of the cone when the axis is inclined at 25^0 to VP.