Long Answers → Case-3: (3 stage Problems) Inclined to both HP & VP

Possible orientations and their analysis

(1) For Cones:

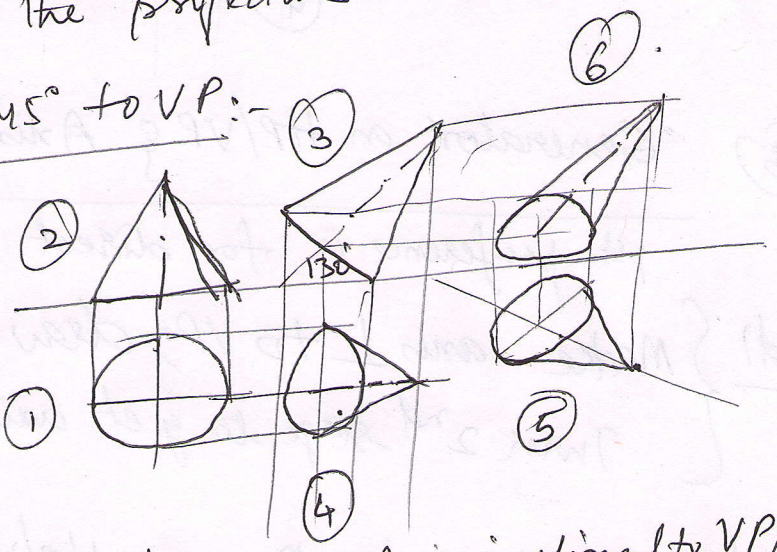
(a) Axis inclined to both HP & VP.

soln: → Start in simple position with base on HP/VP depending on axis angle to HP/VP.

→ In 2nd stage, turn the axis w.r.t. HP and draw the projections

→ In 3rd stage, turn the axis w.r.t. VP and draw the projections.

Eg Axis 30° to HP & 45° to VP:-



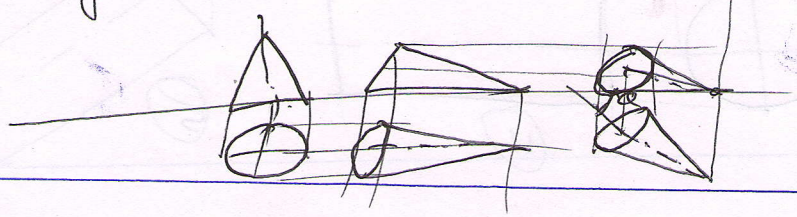
1 (b) Generator on HP/VP and Axis inclined to VP/HP.

1st preference always given to generator position and then only axis position.

∴ If Generator on HP & axis 45° to VP;

make base on HP, get 2 stages.

In 3rd stage, turn axis by 45° & draw projections.

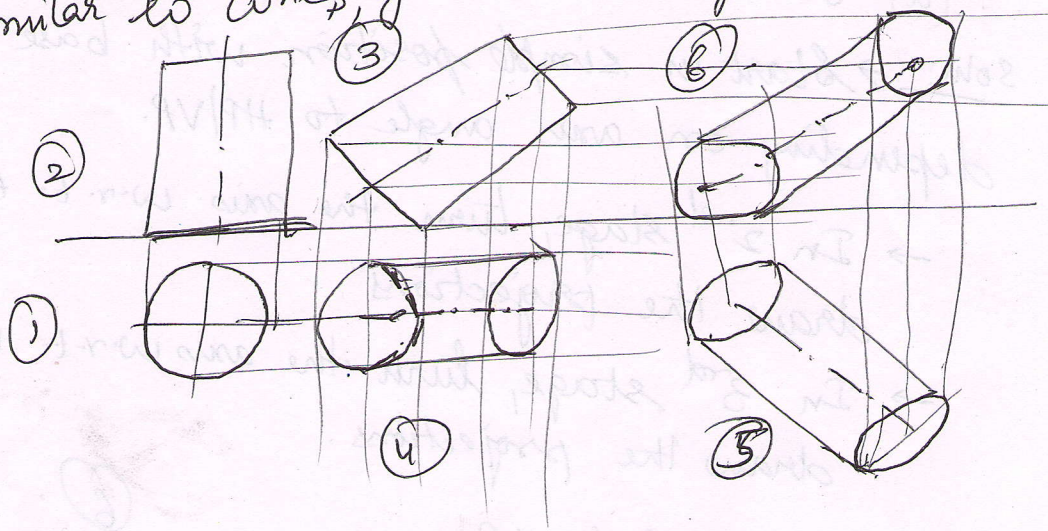


(2) Cylinders:

(a) Axis Inclined to both HP & VP.

Start in simple position with base on HP in TV.

Similar to cones, get the 3 stages



2: (b) Generator on HP/VP & Axis inclined to ∥ VP/HP

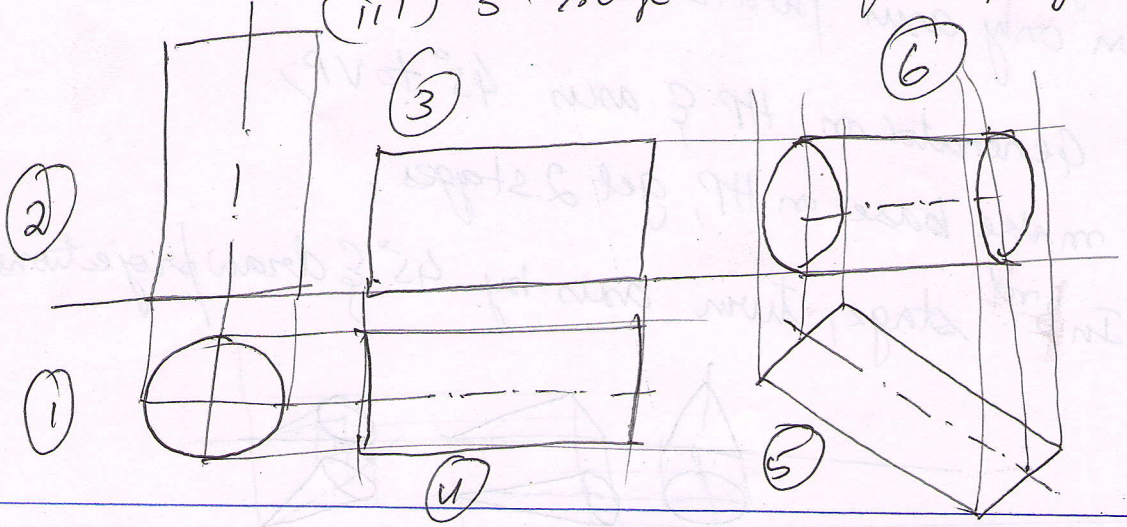
1st preference is for direct 2-stage method;

Method 1 { Make axis ⊥ to VP; draw 1st stage
Turn 2nd stage to get axis in inclined position

Method 2: (i) Keep Base on HP/VP & draw 1st stage.

(ii) Then get 2nd stage similar to cone.

(iii) 3rd stage → draw final projections.

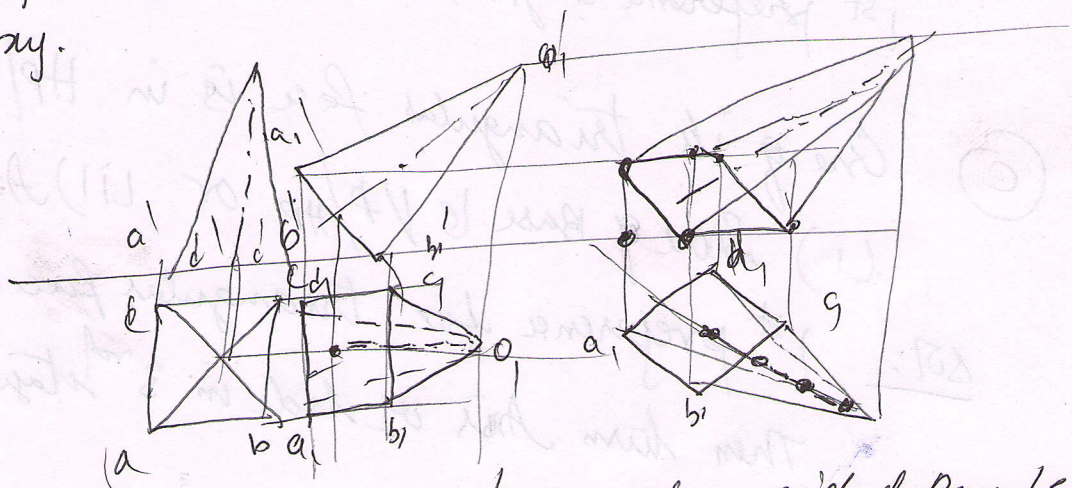


3.1 Pyramids:

(a) Axis can be inclined to both HP & VP.

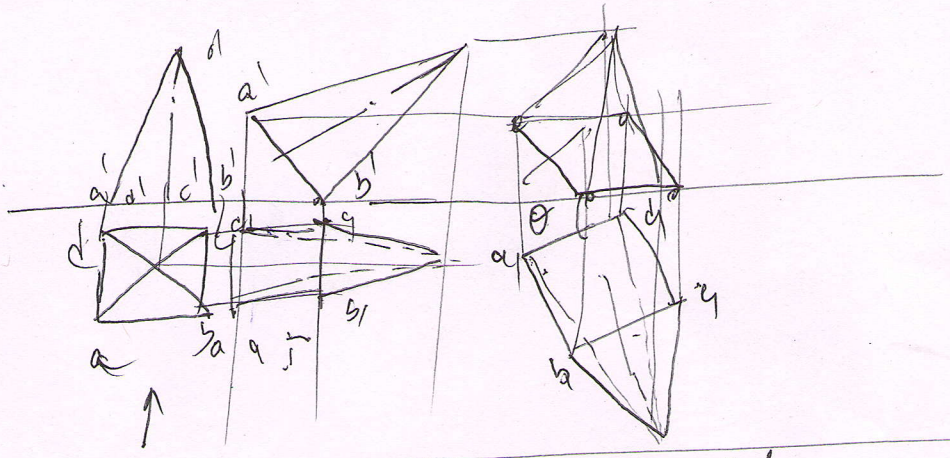
For starting side position, if edge of base is on HP/VP. It should be started ⊥ to xy.

If a corner is resting on HP/VP, starting side is ⊥ to xy.



(b) Axis inclined to HP/VP and a side of Base ⊥ to VP, HP

Soln: 1st preference to axis & 2nd preference to side.



(c) Triangular face on HP/VP and Axis/side ⊥ to VP/HP

1st preference to triangular face. Get 2 stages.

Then in 3rd stage, turn the side or Axis by given angle to get solution:

3. Prisms: Possible orientations.

(a) Axis ⊥ to both HP and VP. } 3 stages.
→ Solve similar to prisms.

(b) Axis ⊥ to VP/HP & side ⊥ to HP/VP

1st preference is given to axis and then to sides.

(c) One of its triangular face is in HP/VP and
(i) Side of Base ⊥ VP/HP or (ii) Axis ⊥ VP/HP.

Sol: 1st preference for triangular face.
Then turn Axis or side in 3rd stage to get solution

3- Stage problems - Solutions

(33) A Cone of 50 mm diameter and 70 mm long axis rests on One of the points of its base in HP. The axis of Cone is 45° to HP & 30° to VP. Draw its projections.

Soln

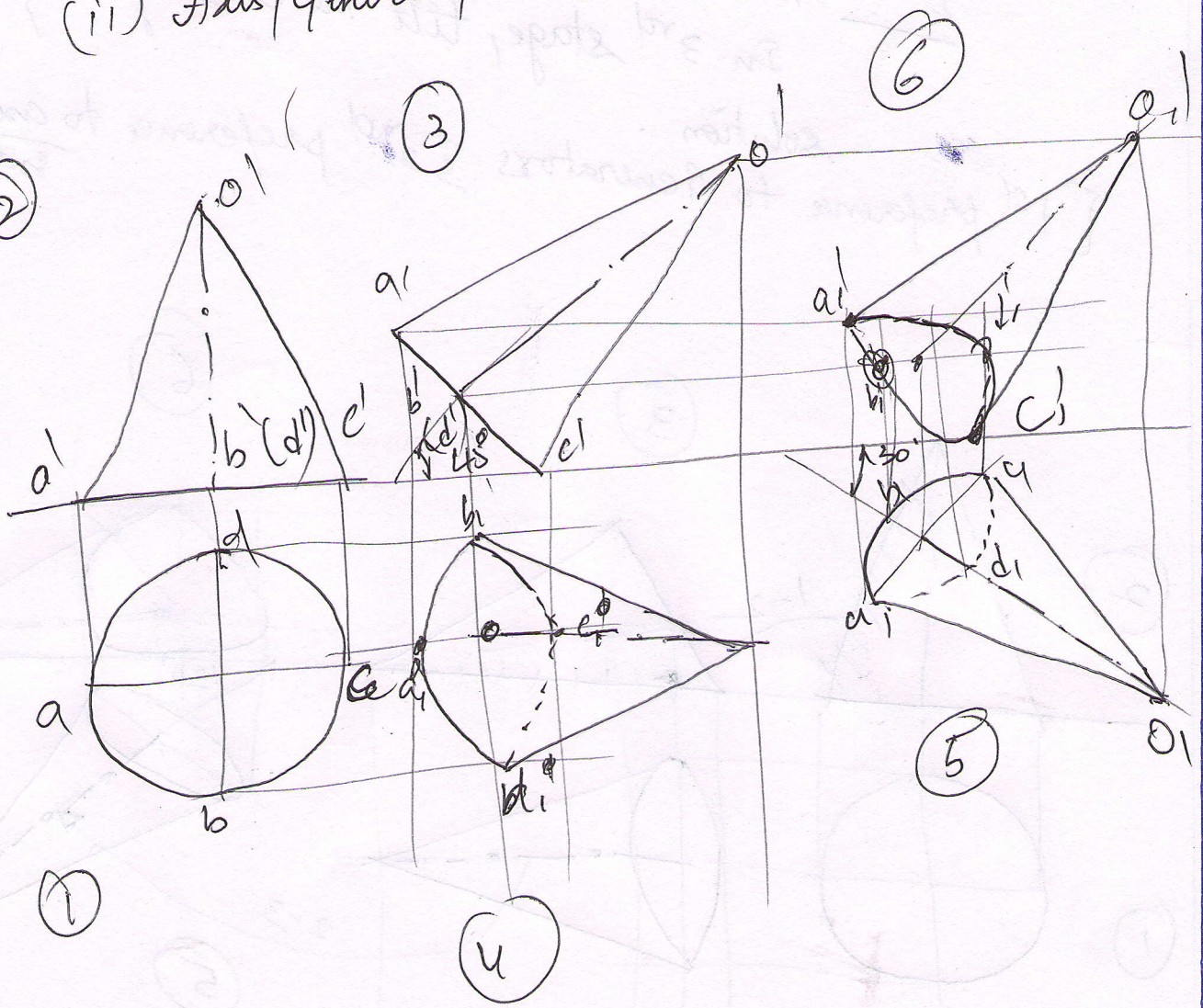
Given data:

shape: Cone

B, H: (ϕ 50, 70)

(i) Axis / Generator angle → 45° to HP.

(ii) Axis / Generator / side Le = 30° to VP.



(34) A Cone, base 40 mm diameter and axis 60 mm long is resting on HP on one of its generators on the HP and axis makes 30° to VP. Draw its projections

Soln Given data:

B H.

Shape: Cone (ϕ 40, 60)

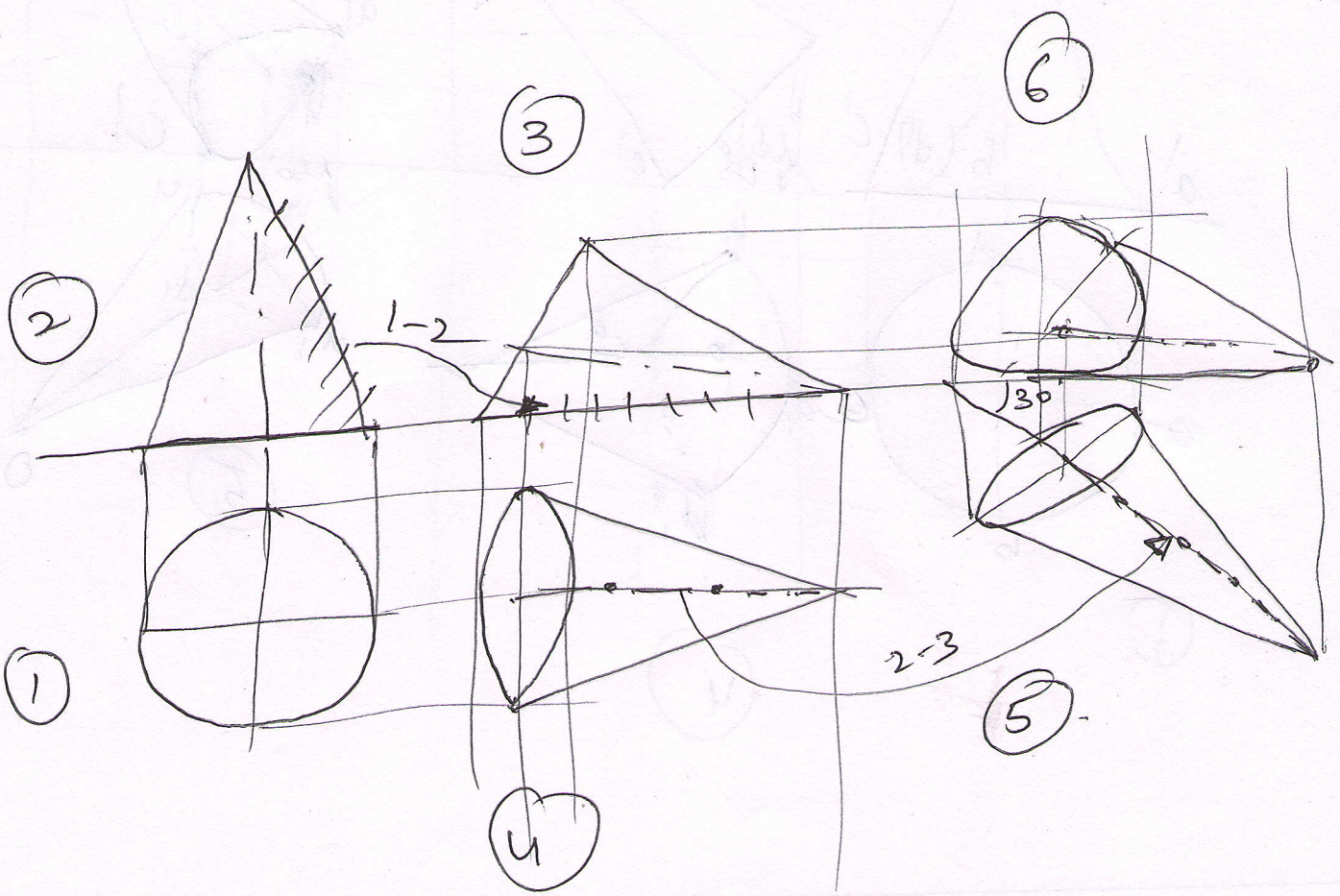
1st: Axis / Generator position: Generator on HP.

∴ start with base on HP like prob no: 28. Get 2 stages.

2nd: Axis $\angle e$ = 30° to VP

In 3rd stage, tilt the axis by 30° & obtain solution.

[1st preference to Generators & 2nd preference to axis / side etc.



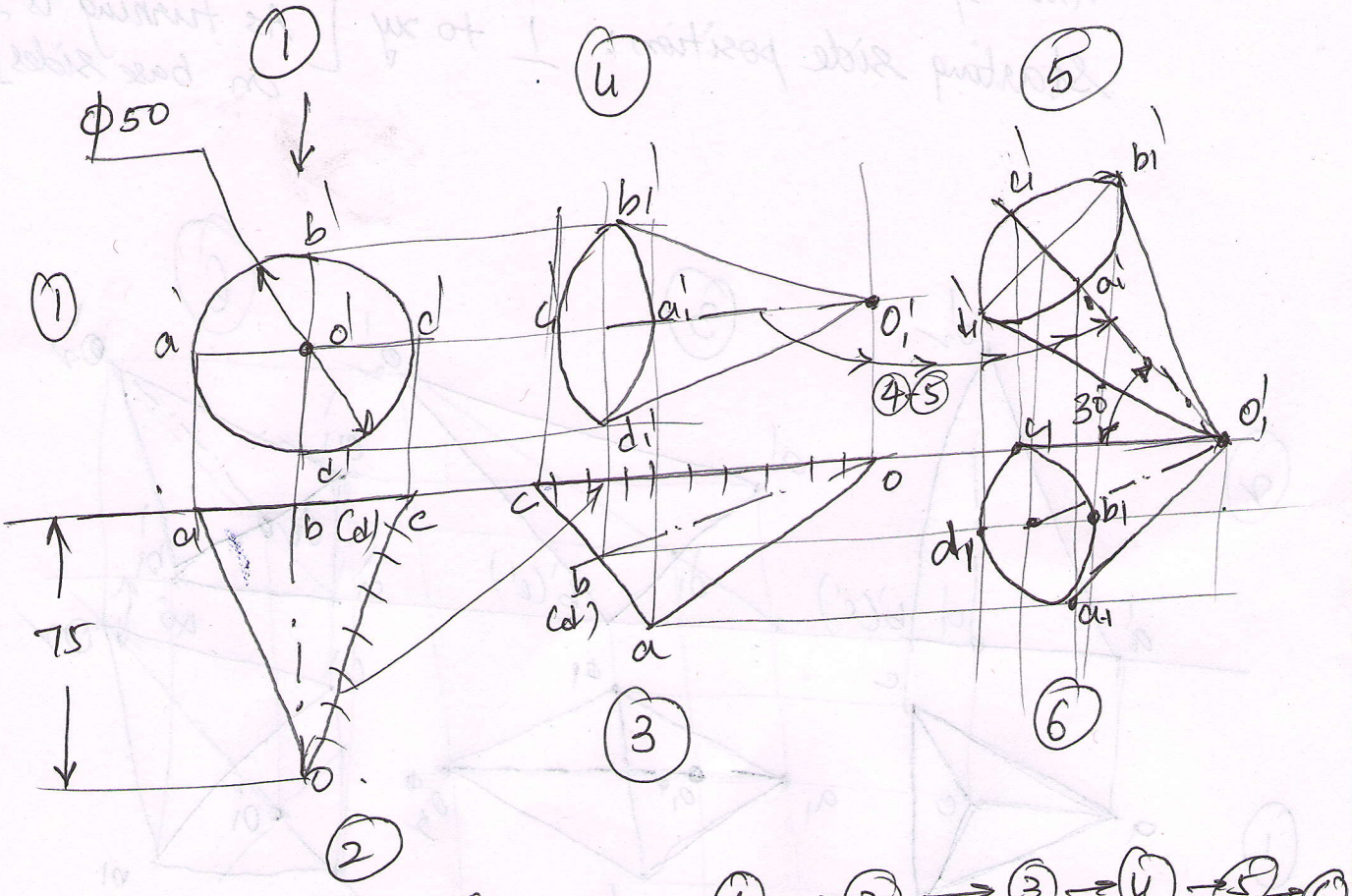
(35) Draw 3 views of a cone of (Ø 50, 75) having one of its Generators in the VP and Axis inclined at 30° to the HP, the apex being in the HP.

(A)

Cone – (ϕ50, 75)

Generators → In VP (2 stages; start with base in VP)

Axis → 30° to HP (3rd stage);



Sequence : (1) → (2) → (3) → (4) → (5) → (6)

(36) An equilateral triangular pyramid of base 40 mm sides and axis 65 mm long rests in HP on one of its base sides. Draw the projections if the axis makes 25° & 40° with HP and VP respectively.

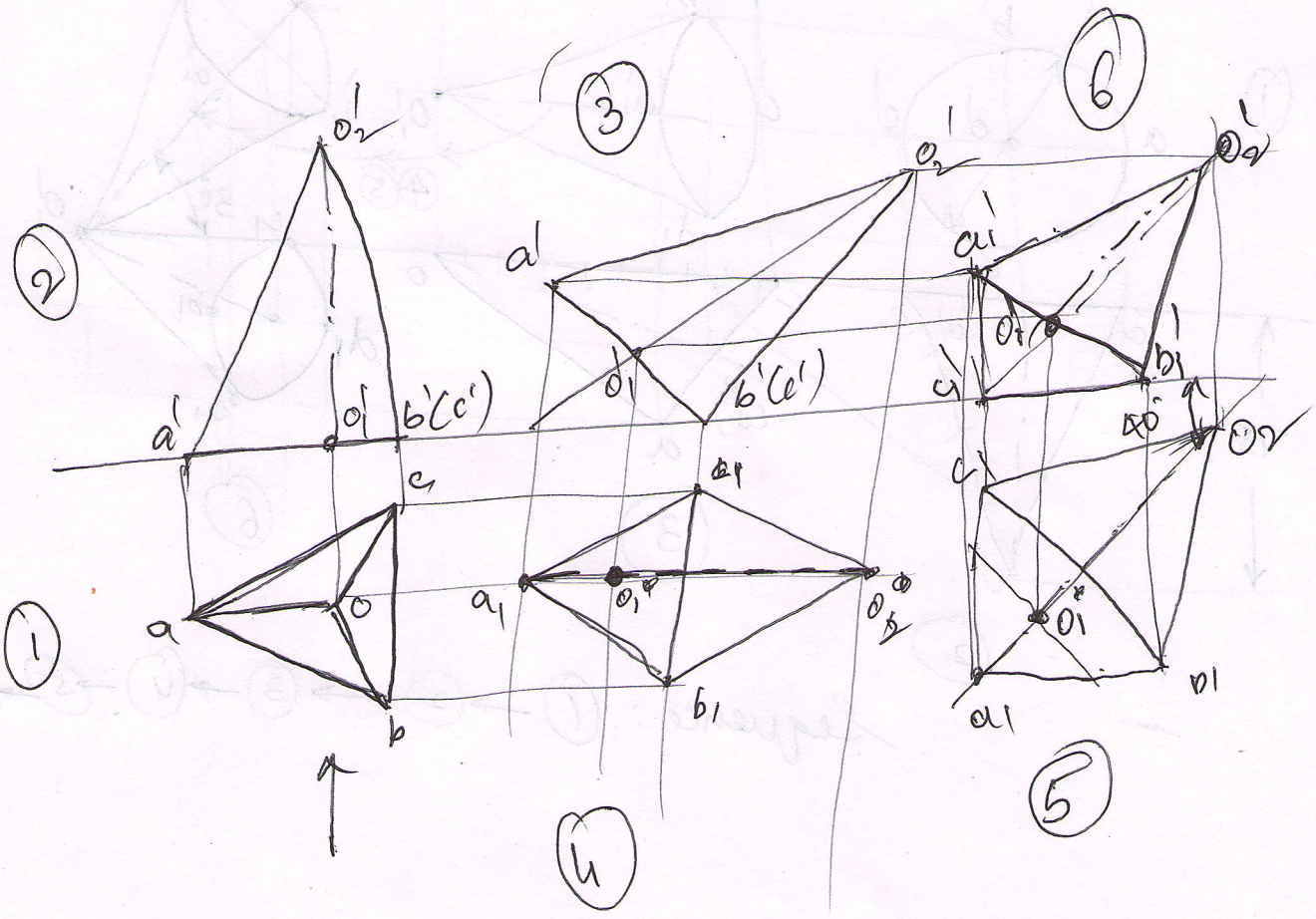
Soln

Shape: Eq. Δ^{lar} pyramid (B 40, H 65)

Axis position ①: 25° to HP. (Start in TV with Axis ⊥ HP)

Axis position ②: 40° to VP.

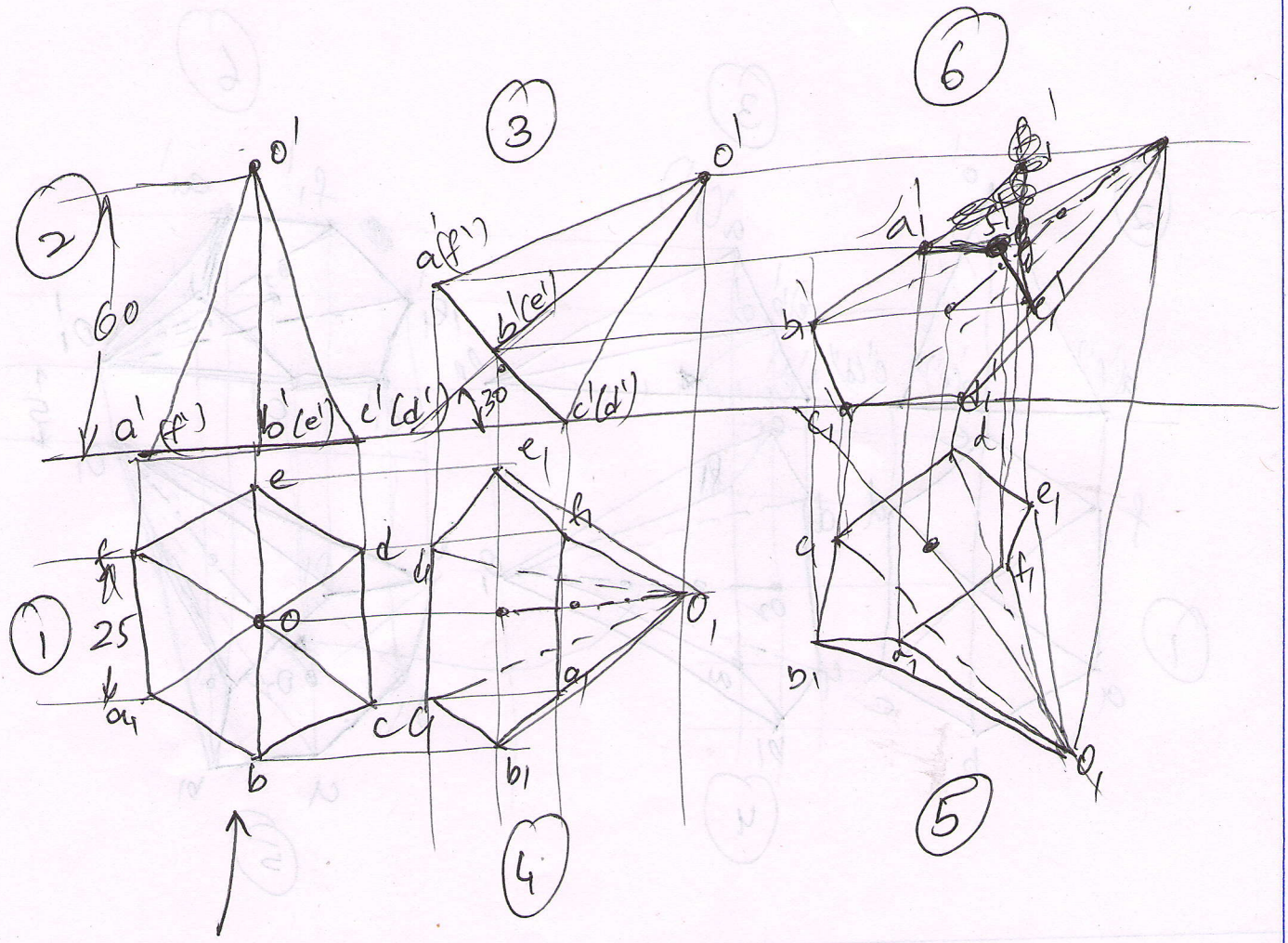
Starting side position: ⊥ to xy [As turning is on base sides].



① → ② → ③ → ④ → ⑤ → ⑥

(38) (37) Hexagonal pyramid, (B, H) (25, 60) has an edge of base on ground (⇒ side ⊥)
Its axis is inclined at 30° to the ground and 45° to the VP. Draw its projections

(A) shape: Hexagonal pyramid. (25, 60).
Axis position 1: 30° to HP [start in TV; axis ⊥ HP]
Axis position 2: 45° to VP.
Starting side position: ⊥ to xy [As edge of base on ground in tilted position]

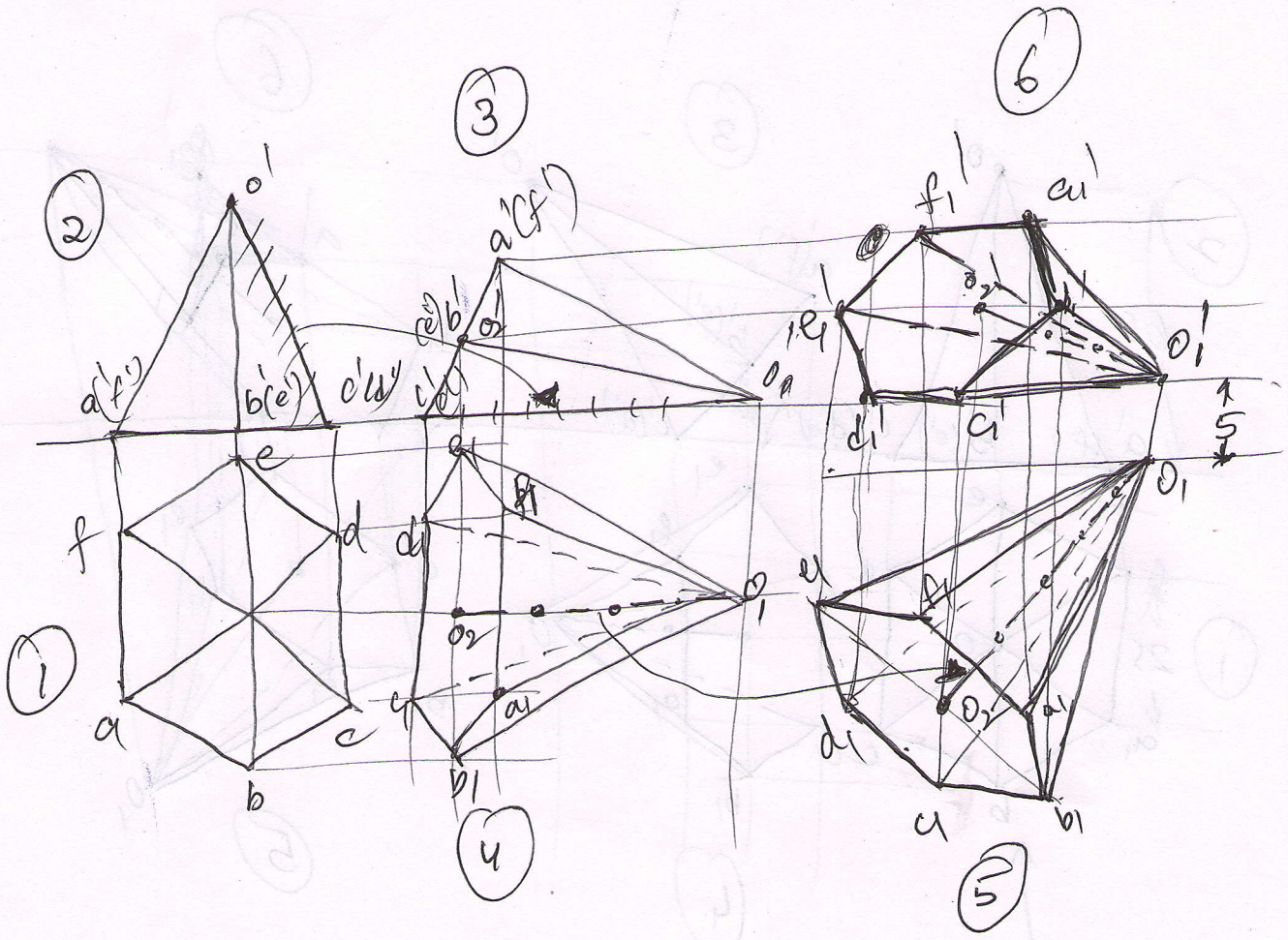


(38) A hexagonal pyramid, edge of base 30mm and height 70mm lies on one of its triangular faces on the HP. The centre line of the triangular face (axis) makes 45° to VP. Its vertex is 5mm in front of VP. Draw the FV & TV of pyramid

(A) Hexagonal pyramid (30, 70) (6, 120°)

Axis | Face position: Triangular face on HP } 1st & 2nd
C°. slant base on HP } stages
side ⊥ to xy

Axis | side position: Axis 45° to VP → 3rd stage.



(39) A pentagonal pyramid, base 25 mm side and axis 50 mm long has one of its triangular faces on the VP and the edge of the base contained by that face makes an angle of 30° with the HP. Draw its projections.

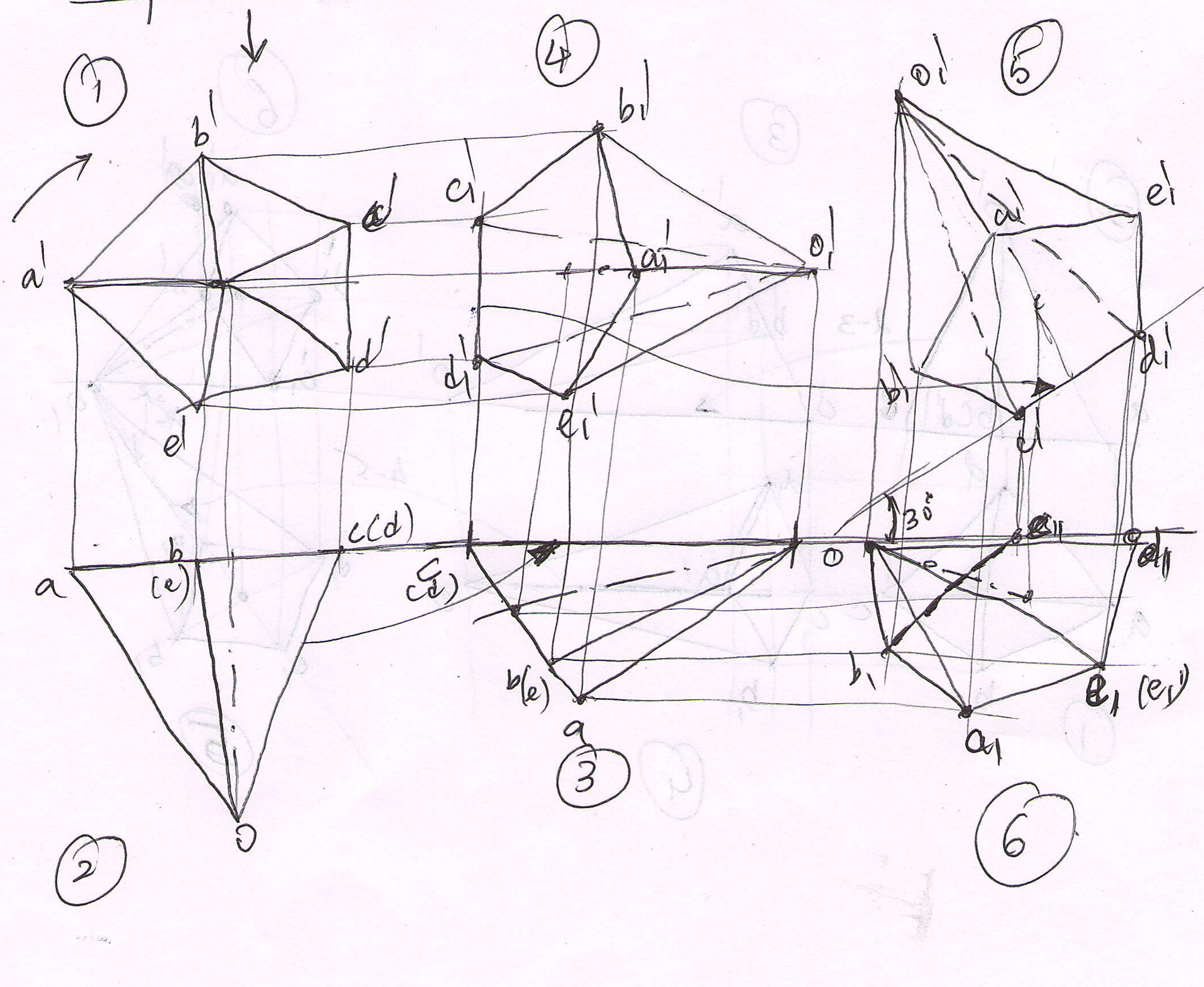
Soln

shape: Pentagonal Pyramid (25, 50).

①② Axis | Face position: Triangular face on VP

∴ Base on VP; side ⊥ to xy; 2 stages to be drawn)
start in FV

③ Axis | Side position: side 30° to HP (3rd stage).



(40) A square pyramid of 50 mm side and 80 mm long axis is placed on the ground on one of its slant edges such that apex is in VP and the slant edge makes 45° to VP. Draw its projections.

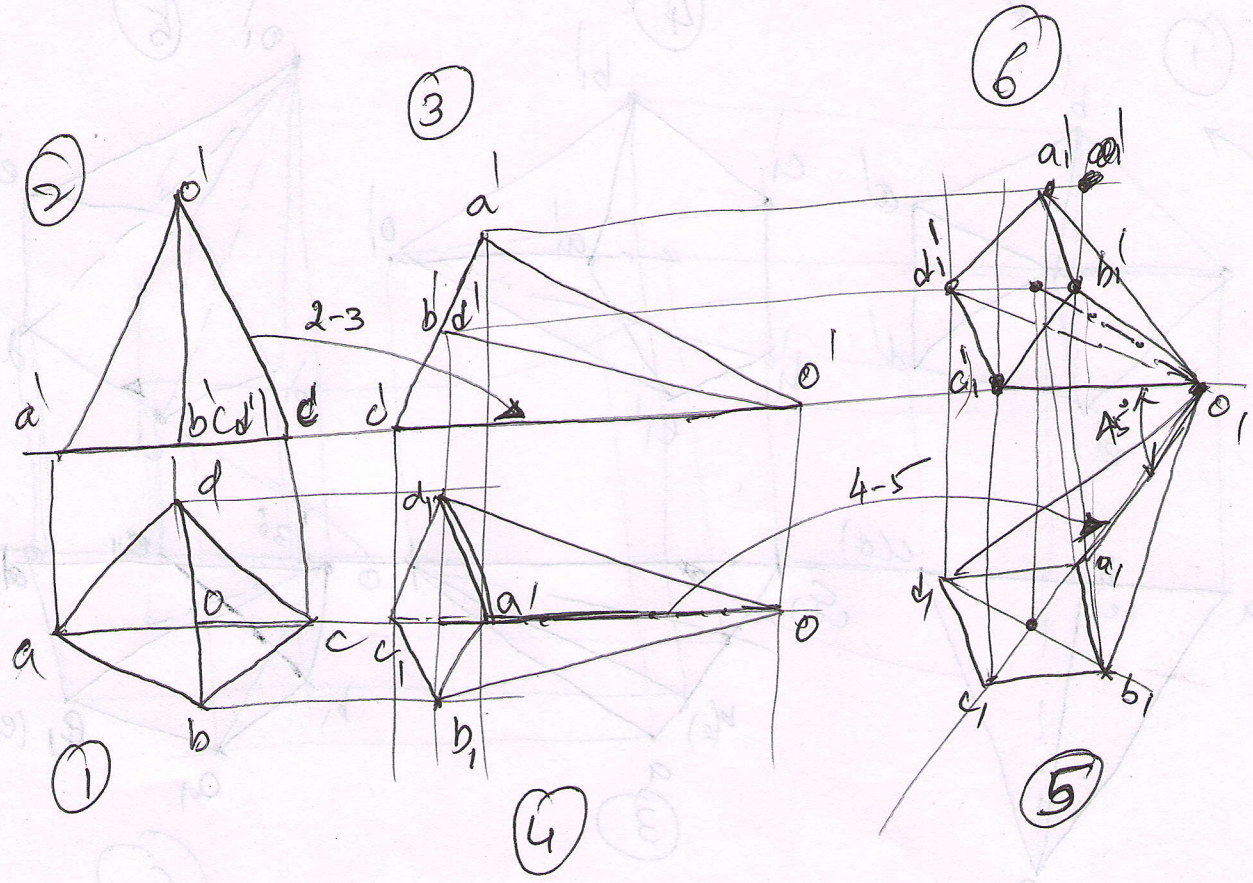
A:

Shape: Square pyramid (50, 80).

Face/ Slant edge position: slant edge on HP.

[Start in ↑ V; starting side 45° to xy] (2 stages)

3rd stage → slant edge → 45° to VP.



(41) A right regular pentagonal prism, side of base 30mm and height 70mm rests on one of its base corners on HP such that its long edge containing the corner is inclined at 45° to the HP and the side of base opposite to the corner is inclined at 30° to VP. Draw its projections keeping the vertex towards the VP.

(A) Shape: pentagonal prism of (30, 70)

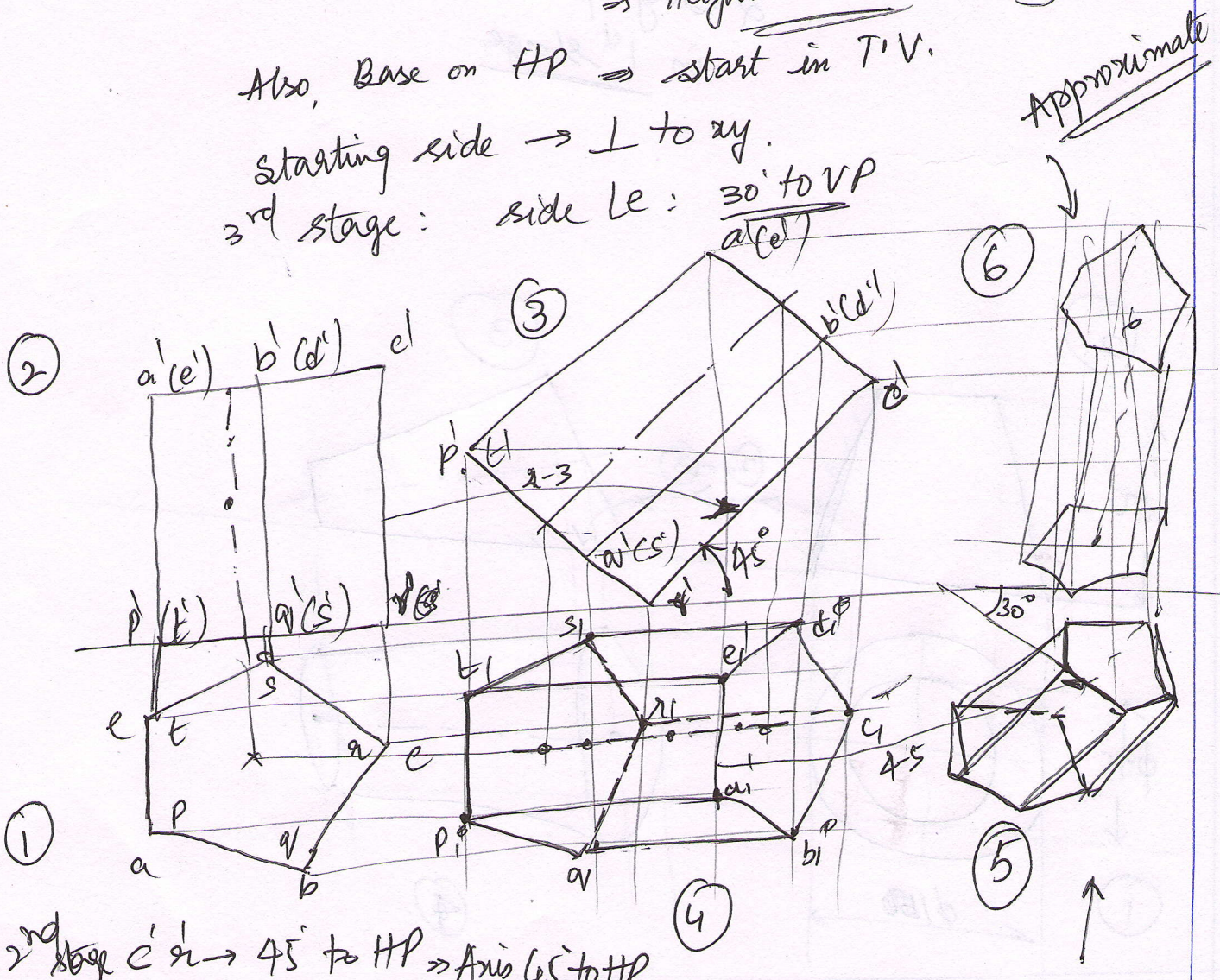
1st & 2nd stage data: long edge containing corner (⇒ Axis) or (Height)
⇒ Vertical edge of prism } 45° to HP.
⇒ Height or axis.

Also, Base on HP ⇒ start in T.V.

Starting side → ⊥ to xy.

3rd stage: side Le: 30° to VP

Approximate



2nd stage c'r' → 45° to HP ⇒ Axis 45° to HP

(42) ~~Assignment~~. Refer to Prob NO: Example: 13.3 in ND Bhat

(44) ~~Assignment~~: Refer to Article 13.5 in Projections of spheres

(43) A thin lamp shade in the form of a frustum of cone has its larger end 150mm diameter, smaller end 75mm diam and height 100mm. Draw its 3 views when it is lying on its side on the ground and the axis parallel to VP. (generators).

(A) Shape: Frustum of cone $(B, T, H) = (\phi 150, \phi 75, 100)$

B → Base; T → Top; H → Axis.

Condition: Generator on Ground (side = Generator)

∴ 2 stage problem with base on ground in 1st stage