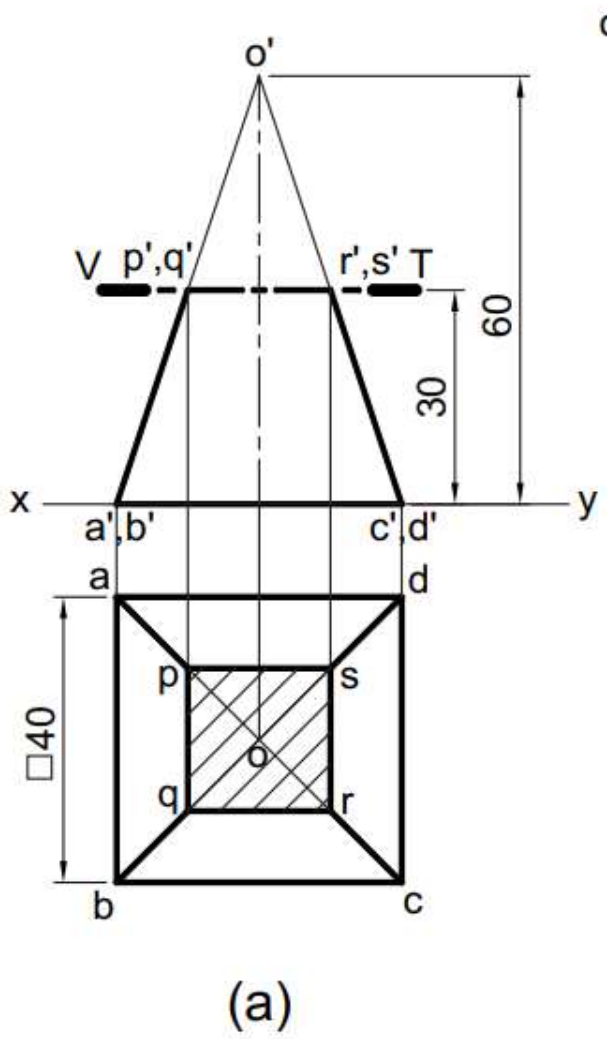
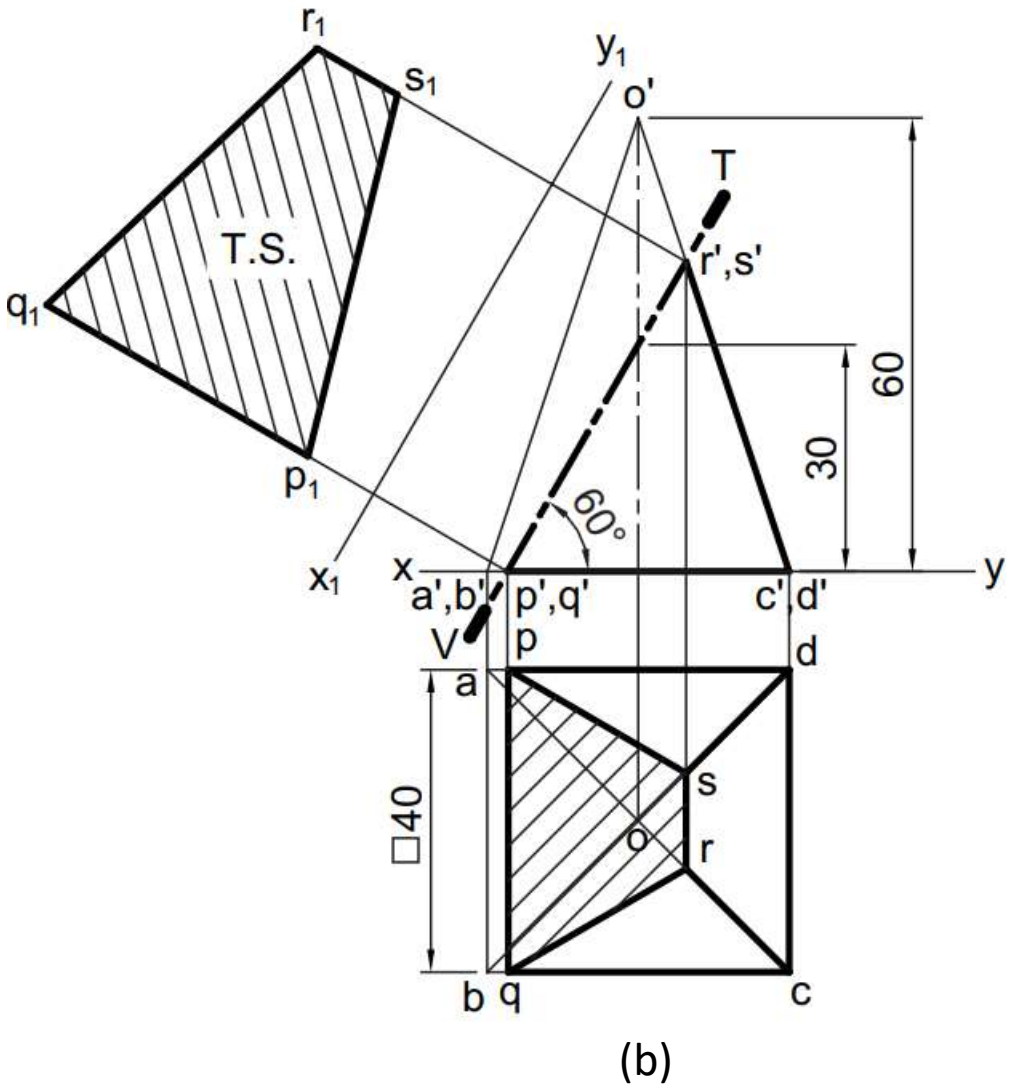
Engineering Graphics
DS - 1005 (C1 , C2 and E1)

Sections of Solids

Q.1. A square pyramid of base side 40 mm and axis 60 mm is resting on its base on the H.P. with a side of base parallel to the V.P. Draw its sectional views and true shape of the section, if it is cut by a section plane perpendicular to the V.P., bisecting the axis and is
(a) parallel to the H.P., (b) inclined at 60° to the H.P

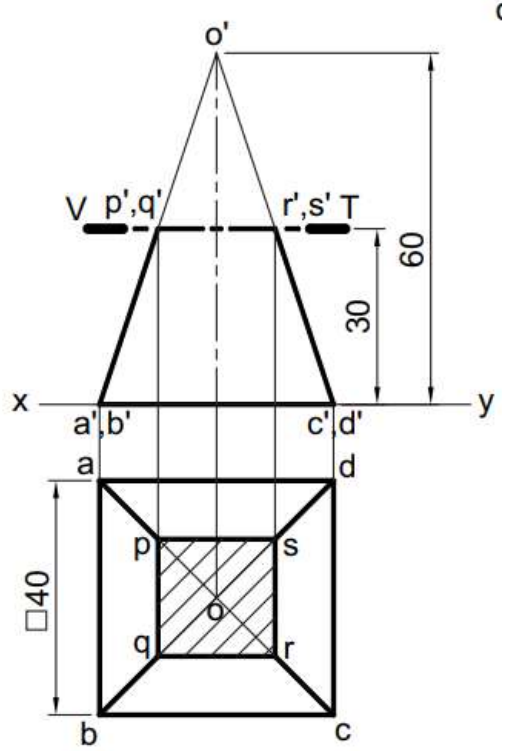


(a)

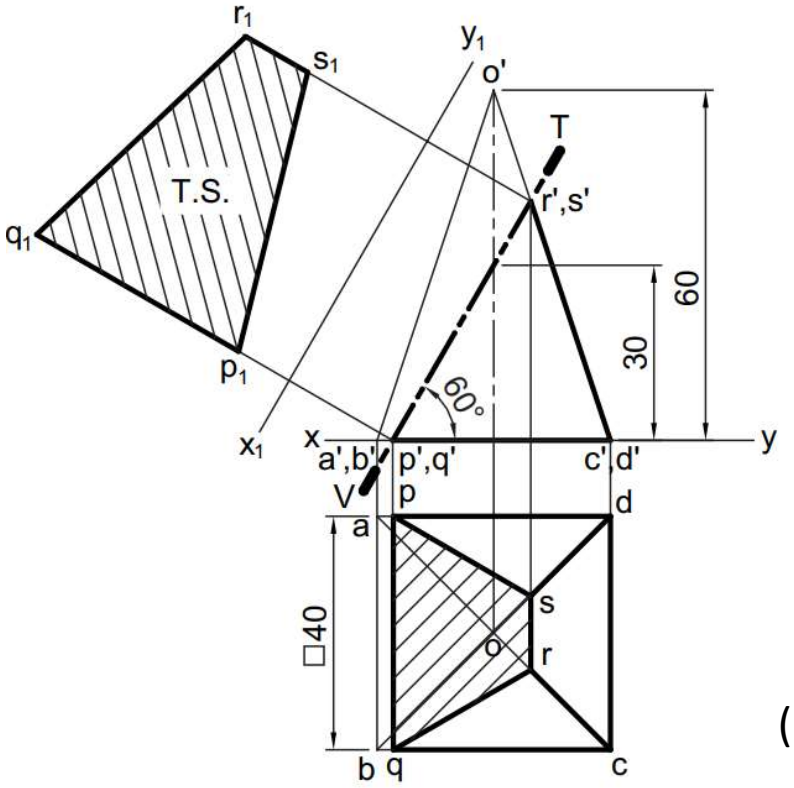


(b)

Q.1. Cont'd



(a)



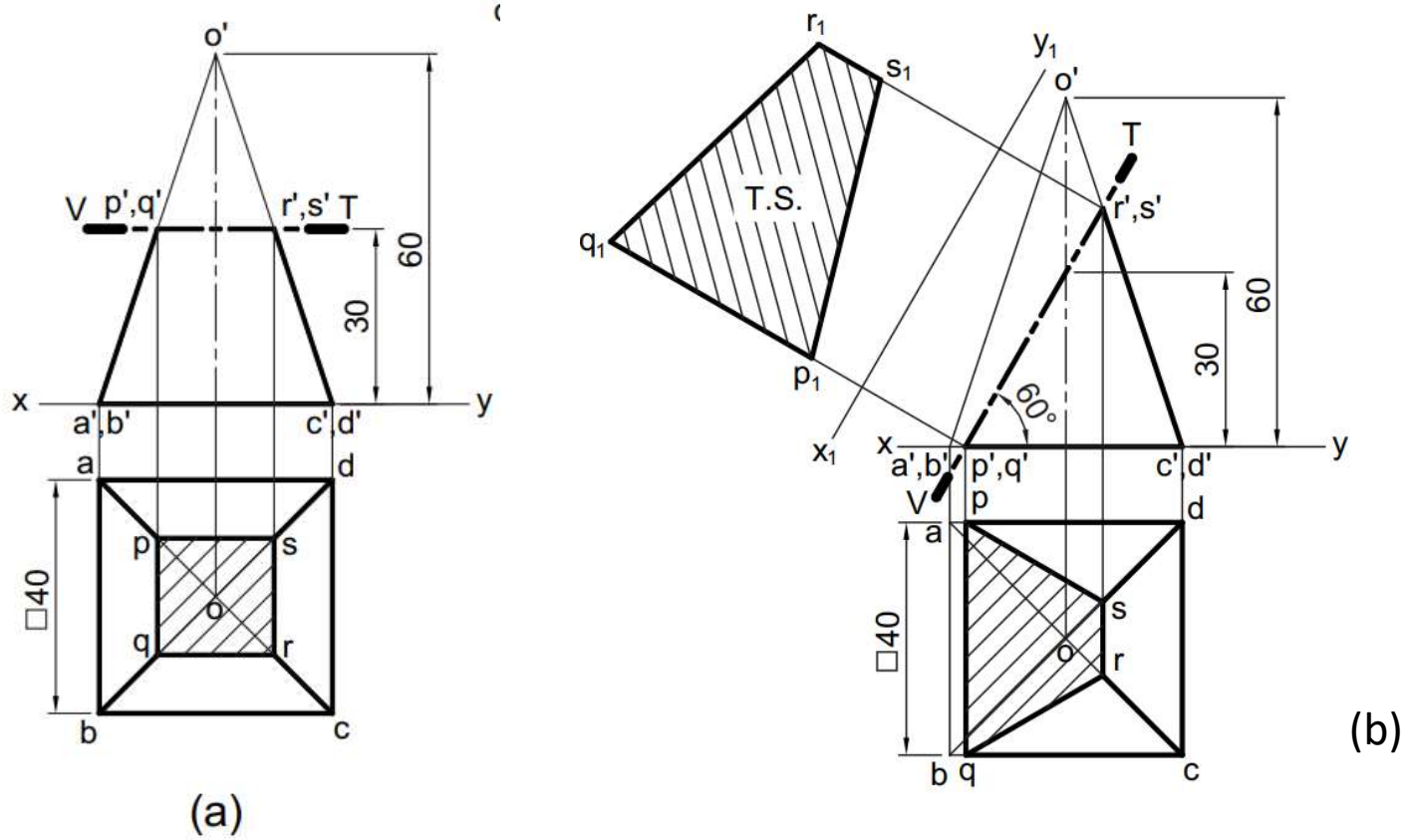
(b)

Projections Draw a square *abcd* keeping side ad parallel to *xy* and join the corners with centroid *o*. This represents the top view. Project the corners and obtain *b′c′o′* as the front view.

(a) Section plane parallel to the H.P. Refer to Fig. 12.9(a).

1. **Cutting plane** Draw V.T. of the section plane parallel to *xy* bisecting the axis. Let V.T. cut the edges *o′a′* at *p′*, *o′b′* at *q′*, *o′c′* at *r′* and *o′d′* at *s′*.
2. **Sectional top view** Project *p′*, *q′*, *r′* and *s′* to meet their respective edges *oa*, *ob*, *oc* and *od* in the top view at points *p*, *q*, *r* and *s*. Join *pqrs* and hatch the enclosed space.
   As the section plane is parallel to *xy*, *pqrs* represents the true shape of the section.

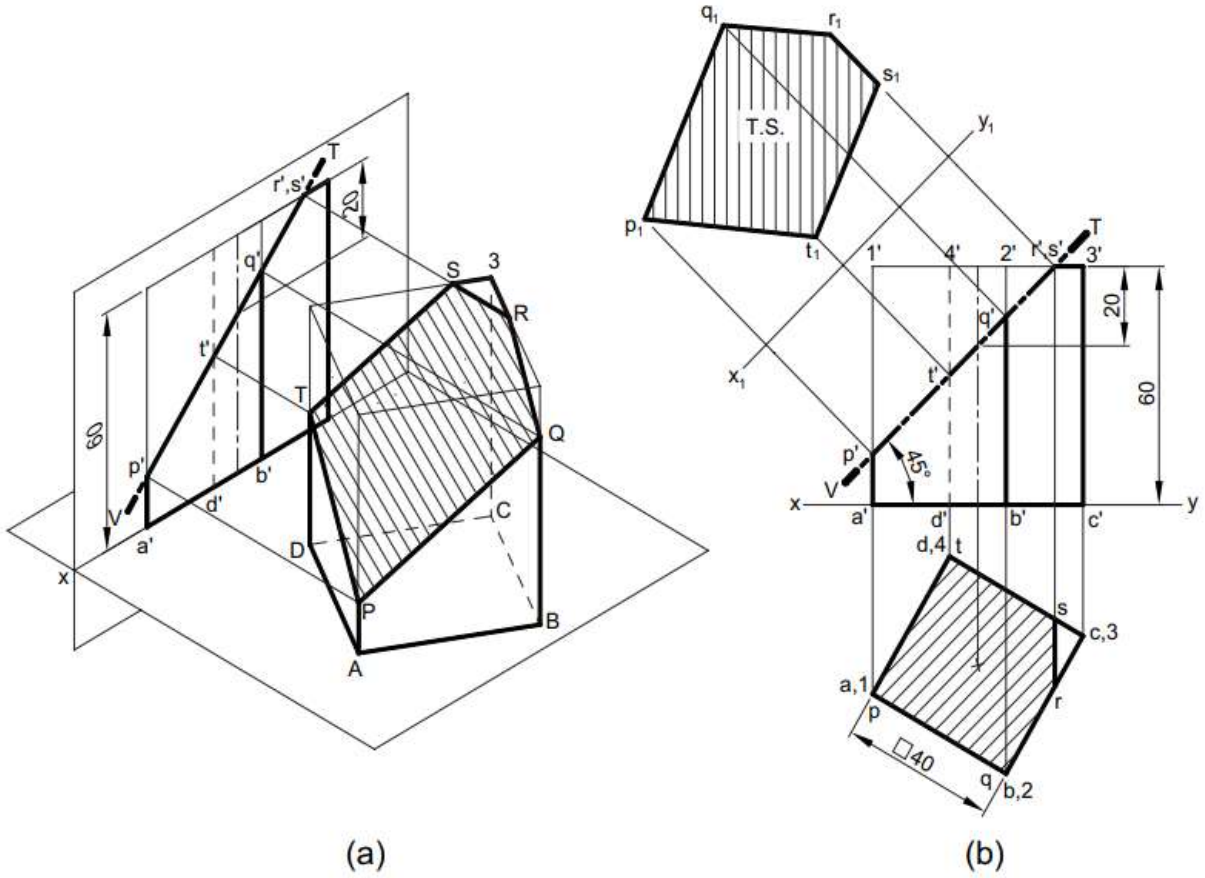
Q.1. Cont'd



(b) Section plane inclined at 45° to the H.P. Refer to Fig. 12.9(b).

1. **Cutting plane** Draw V.T. of the section plane inclined at 45° to xy bisecting the axis. Let V.T. cut the edges $o'a'$ at p', $o'b'$ at q', $o'c'$ at r' and $o'd'$ at s'.
2. **Sectional top view** Project p', q', r' and s' to meet their respective edges oa, ob, oc and od in the top view at points p, q, r and s. Join $pqrs$ and hatch the enclosed space.
3. **True shape** Draw x_1y_1 parallel to V.T. Project points p', q', r' and s' on x_1y_1. Locate p_1, q_1, r_1 and s_1 on the projectors such that their distances from x_1y_1 are equal to the distances of p, q, r and s from xy respectively. Join $p_1q_1r_1s_1$ and hatch the enclosed space to get the true shape of section.

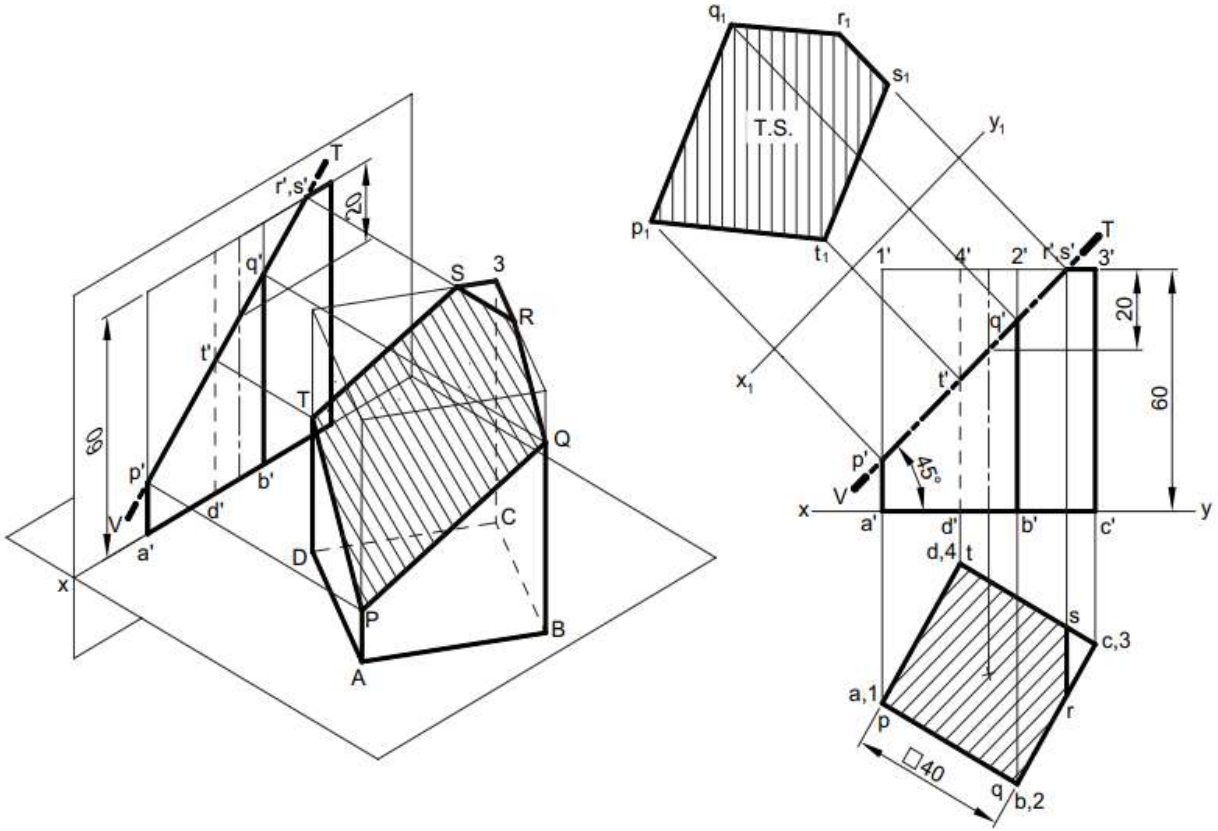
Q.2. A square prism of base side 40 mm and axis 60 mm rests on its base on H.P. such that one of the vertical faces is inclined at 30° to the V.P. A section plane perpendicular to V.P., inclined at 45° to H.P. passing through the axis at a point 20 mm from its top end cuts the prism. Draw its front view, sectional top view and true shape of section



Section of prism by A.I.P. **(a)** *Pictorial view* **(b)** *Orthographic view*

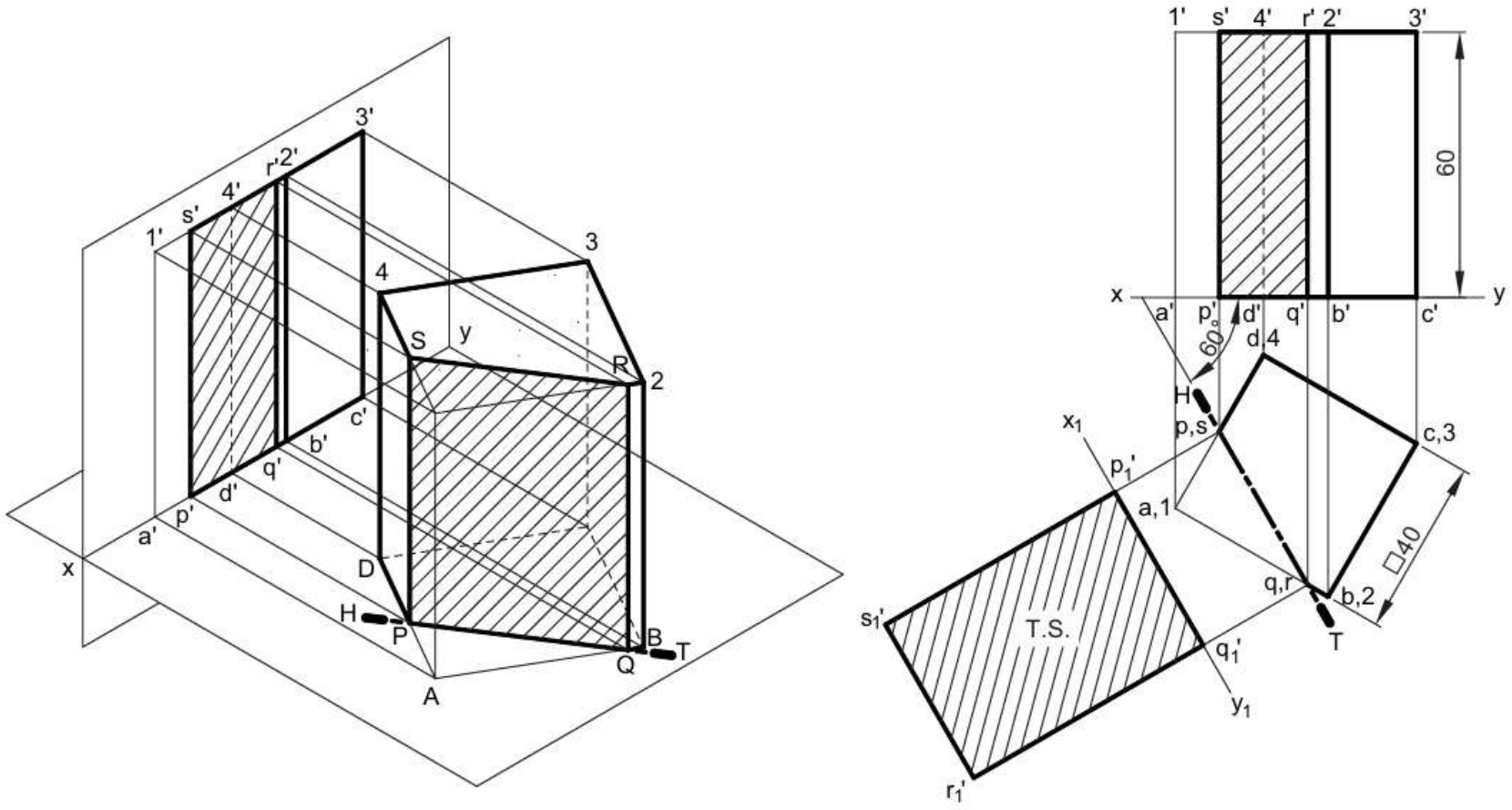
1. **Projections** Draw a square *abcd* keeping side *cd* inclined at 30° to *xy* to represent the top view. Project all the corners and obtain $a'c'3'1'$ as the front view.

Q.2. Cont'd



2. **Cutting plane** Draw V.T. of the section plane inclined at 45° to xy passing through a point of the axis 20 mm from its top end. Let V.T. cut the edges $a'1'$ at p', $b'2'$ at q', $2'3'$ at r', $3'4'$ at s' and $d'4'$ at t'.
3. **Sectional top view** Project points p', q', r', s' and t' to meet the top view at points p, q, r, s and t. Join $pqrst$ and hatch the enclosed space.
4. **True shape** Draw x_1y_1 parallel to V.T. Project points p', q', r', s' and t' on x_1y_1. Locate p_1, q_1, r_1, s_1 and t_1 on the projectors such that their distances from x_1y_1 are equal to distances of points p, q, r, s, and t from xy, respectively. Join $p_1q_1r_1s_1t_1$ and hatch the enclosed space to get the true shape of section.

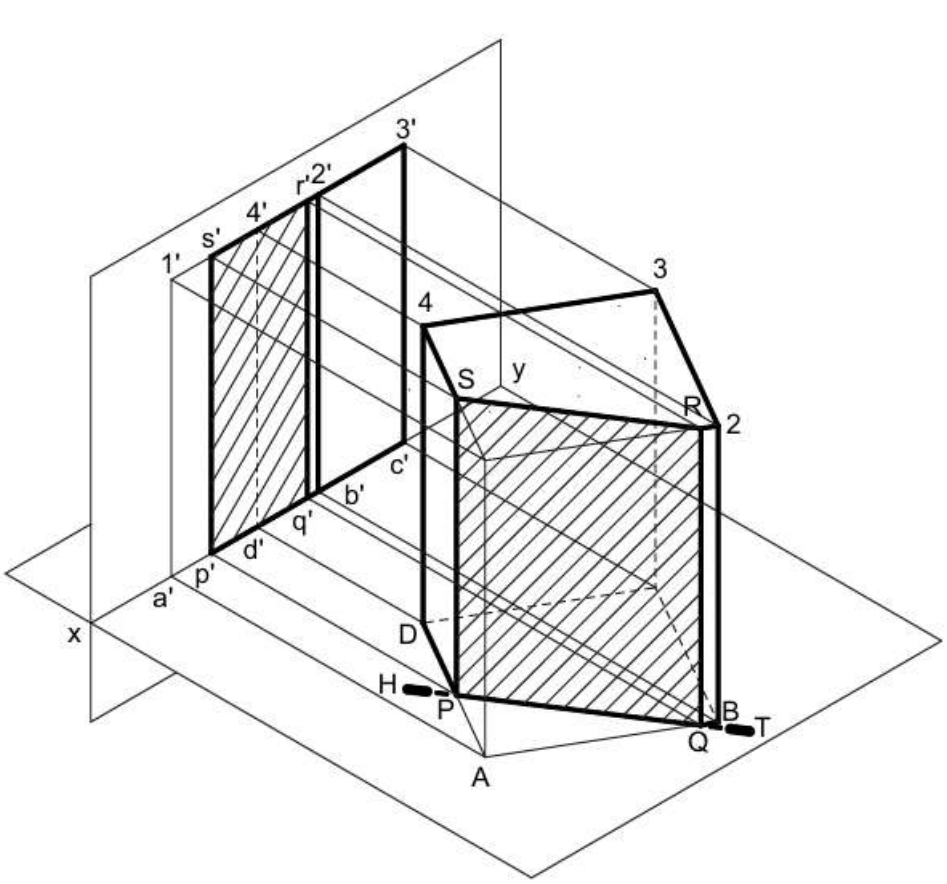
Q.3. A square prism of base side 40 mm and axis 60 mm rests on its base on the H.P. such that one of its rectangular faces is inclined at 30° to the V.P. It is cut by a section plane perpendicular to H.P. and inclined at 60° to V.P. passing through the prism such that a face which is inclined at 60° to the V.P. is bisected. Draw its sectional front view, top view and true shape of section.



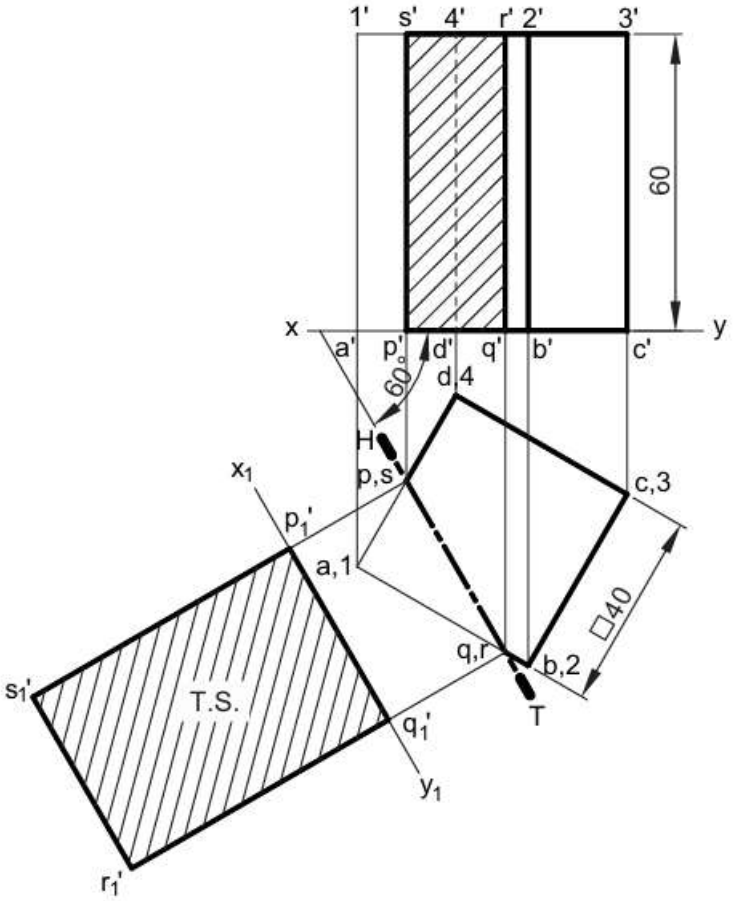
(a) (b)

1. **Projections** Draw a square keeping side *cd* inclined at 30° to *x*y to represent the top view. Project all the corners and obtain $a'c'3'1'$ as the front view.
2. **Cutting plane** Draw H.T. of the section plane inclined at 60° to *xy* and passing through mid-point of side *ad*. Let H.T. cut the edges ad at *p*, *ab* at *q*, 2–1 at *r* and 1–4 at *s*.

Q.3. Cont'd



(a)

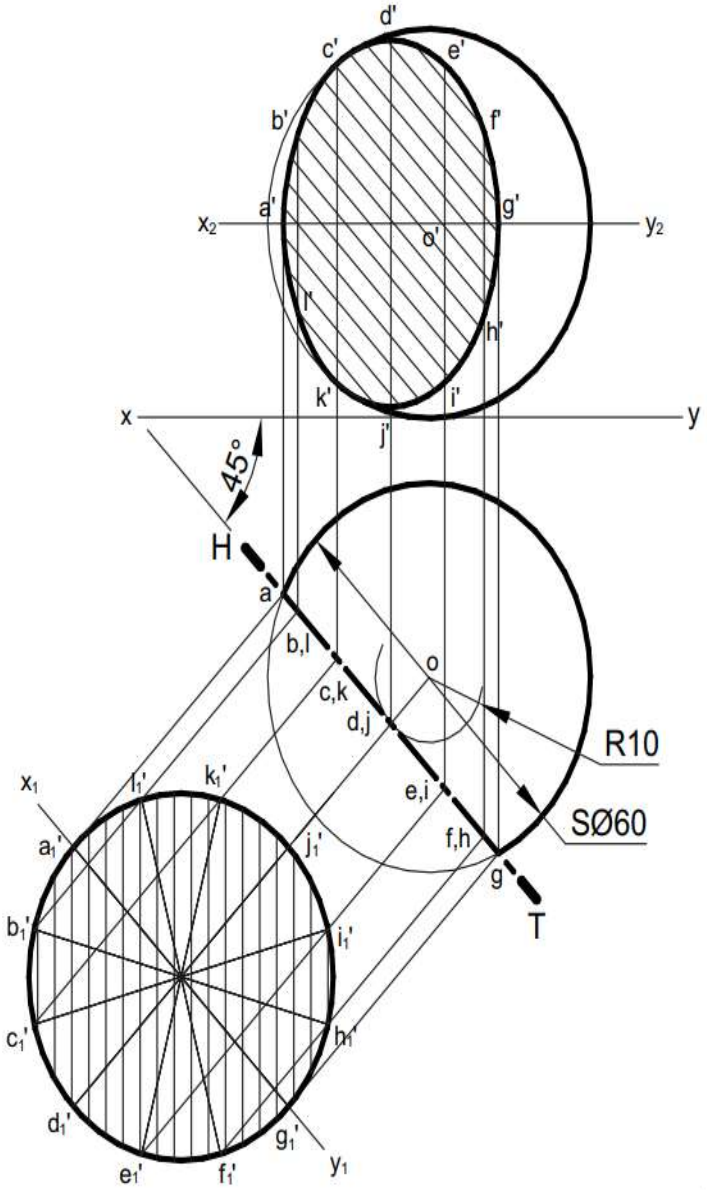


(b)

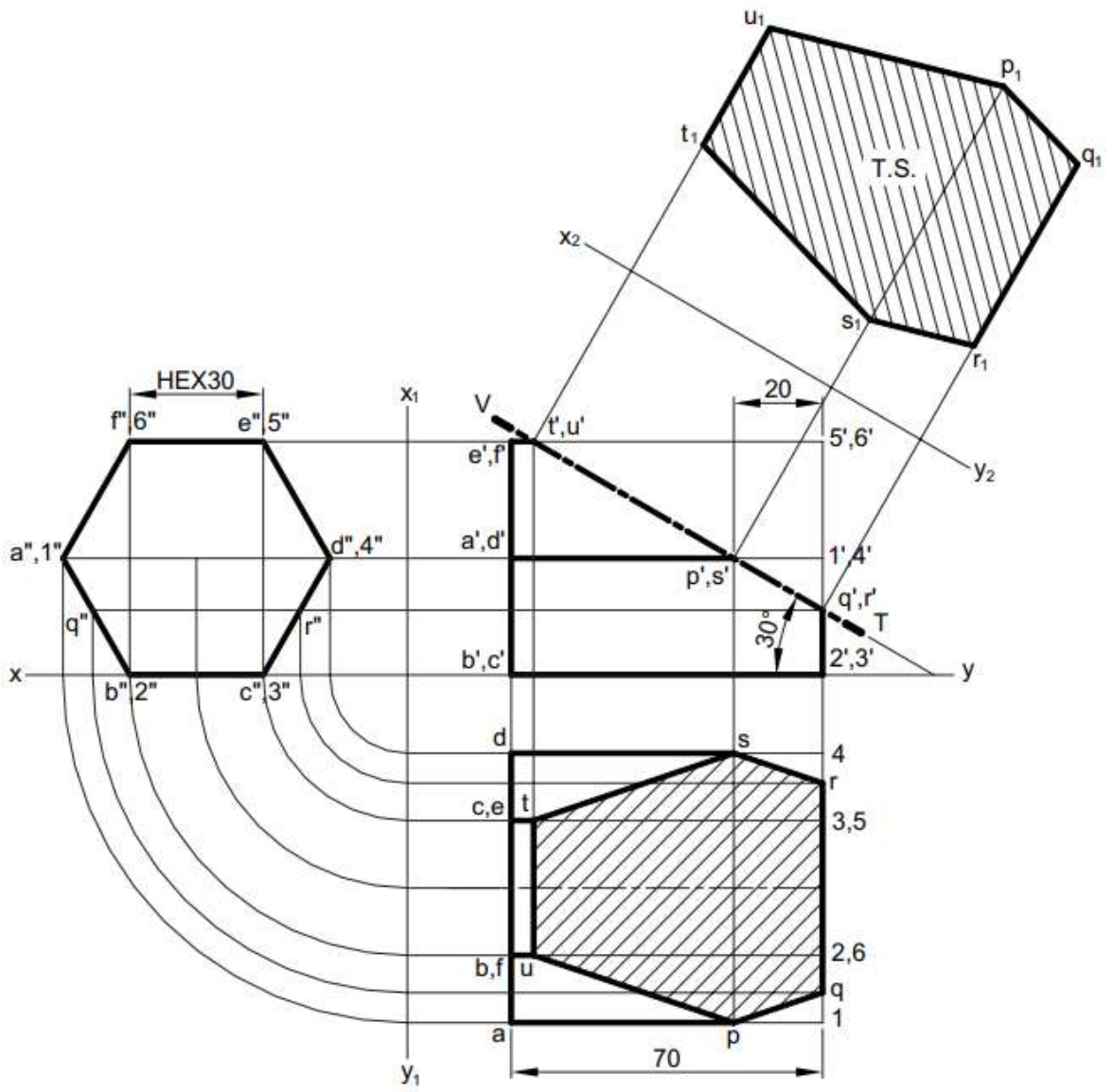
3. **Sectional front view** Project points p, q, r and s to meet corresponding edges $a'd'$, $a'b'$, $2'1'$ and $1'4'$ at points p', q', r' and s'. Join $p'q'r's'$ and hatch the enclosed space.
4. **True shape** Draw x_1y_1 parallel to H.T. Project p, q, r and s on x_1y_1. Locate p_1', q_1', r_1' and s_1' on the projectors such that their distances from x_1y_1 are equal to distances of points p', q', r' and s' from xy, respectively. Join $p_1'q_1'r_1's_1'$ and hatch the enclosed space to get the true shape of section.

Q.4. A sphere of diameter 60 mm is kept on the H.P. It is cut by an A.V.P. inclined at 45° to V.P. The section plane passes through the sphere at a distance of 10 mm from the centre of the sphere and in front of it. Draw its sectional front view, top view and true shape of the section

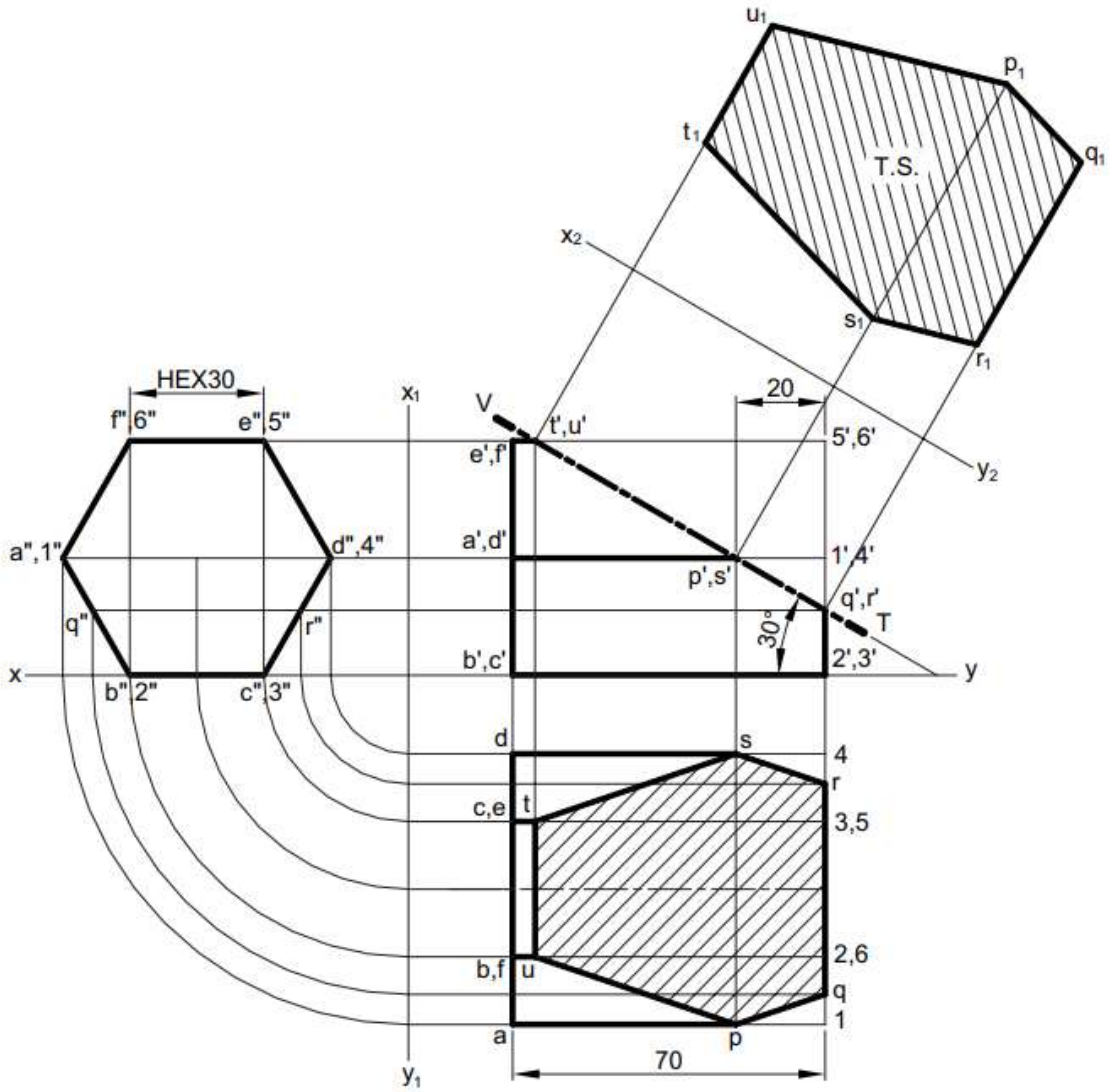
1. **Projections** Draw a circle with centre o and diameter 60 mm as the top view. Project the top view and obtain another circle with centre o' and diameter 60 mm as the front view.
2. **Cutting plane** Draw an arc with centre o and radius 10 mm. Draw H.T. of the section plane inclined at 45° to xy and tangential to the arc. Let it cut the circle at points a and g.
3. **True shape** Draw a line $a_1'g_1'$ parallel and equal to H.T. Draw a circle with diameter $a_1'g_1'$. Hatch the enclosed space to represent the true shape.
   Divide this circle into 12 equal parts and name the divisions as a_1', b_1', c_1', d_1', e_1', f_1', g_1', h_1', i_1', j_1', k_1' and l_1'.
4. **Sectional front view** Project a_1', b_1', c_1', d_1', e_1', f_1', g_1', h_1', i_1', j_1', k_1' and l_1' on H.T. and locate points a, b, c, d, e, f, g, h, i, j, k and l, respectively.
   Project points a, b, c, d, e, f, g, h, i, j, k and l to the front view. Obtain points a', b', c', d', e', f', g', h', i', j', k' and l' on the projectors such that their distances from x_2y_2 are equal to distances of points a_1', b_1', c_1', d_1', e_1', f_1', g_1', h_1', i_1', j_1', k_1' and l_1' from $a_1'g_1'$.
   Hatch the enclosed space.



Q.5. A hexagonal prism of base side 30 mm and axis 70 mm is resting on a face on the H.P. with axis parallel to the V.P. It is cut by a plane whose V.T. is inclined at 30° to the reference line and passes through a point on the axis 20 mm from one of its ends. Draw its sectional top view and obtain true shape of the section

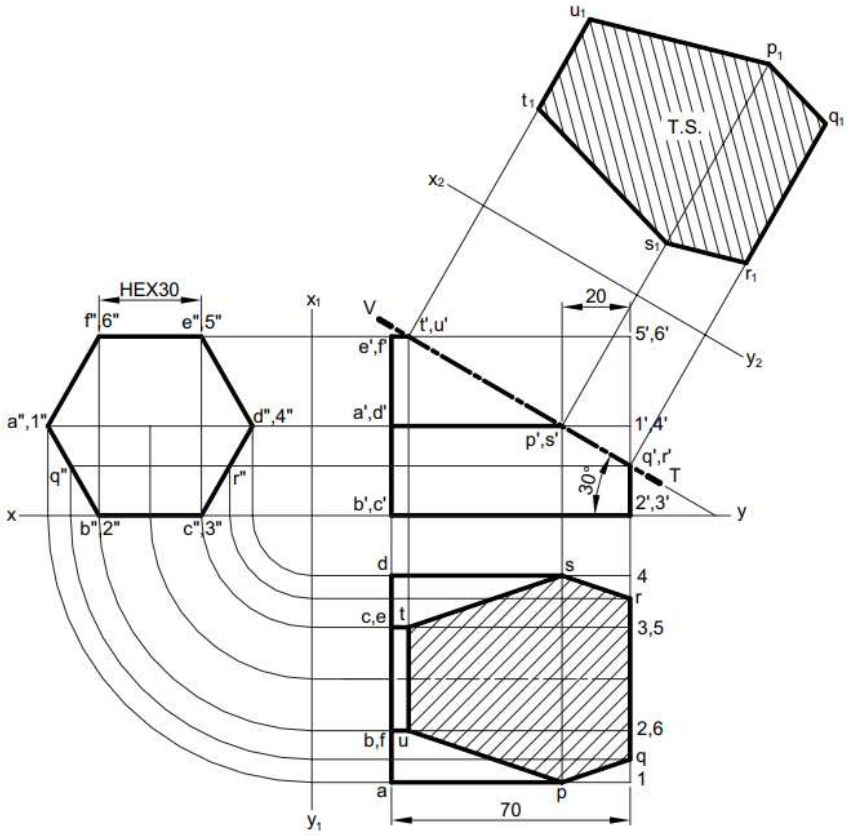


Q.5. Cont'd



1. **Projections** Draw a hexagon $a''b''c''d''e''f''$ keeping side $b''c''$ on xy. This is the side view. Project this view and obtain $b'2'6'f'$ as its front view and $a14d$ as the top view.
2. **Cutting plane** Draw V.T. of the section plane inclined at 30° to xy and passing through a point on the axis lying at 20 mm from the right end. Let V.T. cut the edges $a'1'$ at p', $1'2'$ at q', $3'4'$ at r', $d'4'$ at s', $e'5'$ at t' and $f'6'$ at u'.

Q.5. Cont'd



3. **Sectional top view** Project p', s', t' and u' to meet in the top view at points p, s, t and u respectively. Points q' and r' cannot be projected directly. Therefore, draw horizontal lines from q' and r' to meet side view at points q'' and r''. Project q'' and r'' perpendicular on xy and then rotate them through 90° and then draw horizontal lines from them such that they meet 1–2 at q and 3–4 at r. Join $pqrstu$ and hatch the enclosed space.

4. **True shape** Draw x_2y_2 parallel to V.T. Project p', q', r', s', t' and u' on x_2y_2. Locate points p_1, q_1, r_1, s_1, t_1 and u_1 on the projectors such that their distances from x_2y_2 are equal to distances of points p, q, r, s, t and u from xy, respectively. Join $p_1q_1r_1s_1t_1u_1$ and hatch the enclosed space to get the true shape of section.