6.1
For $\phi' = 37^\circ$ the active pressure coefficient is given by:

$$K_a = \frac{1 - \sin 37^\circ}{1 + \sin 37^\circ} = 0.25 \quad \text{(or from Table 6.3)}$$

The total active thrust (equation 6.6 with $c' = 0$) is:

$$P_a = \frac{1}{2} K_a \gamma H^2 = \frac{1}{2} \times 0.25 \times 17 \times 6^2 = 76.5 \text{ kN/m}$$

If the wall is prevented from yielding, the at-rest condition applies. The approximate value of the coefficient of earth pressure at-rest is given by equation 6.15a:

$$K_0 = 1 - \sin \phi' = 1 - \sin 37^\circ = 0.40$$

and the thrust on the wall is:

$$P_0 = \frac{1}{2} K_0 \gamma H^2 = \frac{1}{2} \times 0.40 \times 17 \times 6^2 = 122 \text{ kN/m}$$

6.2
The active pressure coefficients for the three soil types are as follows:

$$K_{a1} = \frac{1 - \sin 35^\circ}{1 + \sin 35^\circ} = 0.271$$

$$K_{a2} = \frac{1 - \sin 27^\circ}{1 + \sin 27^\circ} = 0.375 \quad \sqrt{K_{a2}} = 0.613$$

$$K_{a3} = \frac{1 - \sin 42^\circ}{1 + \sin 42^\circ} = 0.198$$
Distribution of active pressure (plotted in Fig. Q6.2):

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Soil</th>
<th>Active pressure (kN/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0.271 x 16 x 3 = 13.0</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>(0.271 x 16 x 3) + (0.271 x 9.2 x 2) = 13.0 + 5.0 = 18.0</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>((16 x 3) + (9.2 x 2)) x 0.375 - (2 x 17 x 0.613) = 24.9 - 20.9 = 4.0</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>4.0 + (0.375 x 10.2 x 3) = 4.0 + 11.5 = 15.5</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>((16 x 3) + (9.2 x 2) + (10.2 x 3)) x 0.198 = 19.2</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>19.2 + (0.198 x 11.2 x 4) = 19.2 + 8.9 = 28.1</td>
</tr>
</tbody>
</table>

Fig. Q6.2

At a depth of 12 m, the hydrostatic pressure = 9.8 x 9 = 88.2 kN/m².

Calculation of total thrust and its point of application (Forces are numbered as in Fig. Q6.2 and moments are taken about the top of the wall) per m:

Total thrust = 571 kN/m

Point of application is \( \left( \frac{4893}{571} \right) \) m from the top of the wall i.e. 8.57 m