



⑥ and ⑦

$$= \frac{1}{3} \pi h_1 (R^2 + r^2 + Rr)$$

$$\frac{l}{L} = \frac{r}{R}$$

$$\Rightarrow L = \frac{rL}{r} \dots \text{--- (iii)}$$

$$\text{or } r = \frac{rL}{L} \dots \text{--- (iv)}$$

② curved surface area of frustum = $\pi RL - \pi rl$

$\triangle AFE \sim \triangle AOC$ by AA cor.

$$\Rightarrow \frac{r}{R} = \frac{h_1}{H} = \frac{l}{L}$$

$$\frac{r}{R} = \frac{h_1}{H} \quad \text{or } r = \frac{h_1 R}{H} \text{--- (i)}$$

$$\Rightarrow H = \frac{h_1 R}{r} \text{--- (ii)}$$

① volume of frustum

$$= \frac{1}{3} \pi R^2 H - \frac{1}{3} \pi r^2 h_1$$

$$= \frac{1}{3} \pi (R^2 H - r^2 h_1)$$

$$= \frac{1}{3} \pi (R^2 \times \frac{h_1 R}{r} - r^2 h_1)$$

using (ii)

$$= \frac{1}{3} \pi \frac{(R^3 h_1 - r^3 h_1)}{r}$$

$$= \frac{1}{3} \pi \frac{h_1}{r} (R^3 - r^3)$$

$$= \frac{1}{3} \pi \frac{h_1}{r} (R - r)(R^2 + r^2 + Rr)$$

$$= \frac{1}{3} \pi \frac{h_1}{r} (R - \frac{h_1 R}{H})(R^2 + r^2 + Rr)$$

(using i)

$$= \frac{1}{3} \pi \frac{h_1 R}{r} (\frac{H - h_1}{H})(R^2 + r^2 + Rr)$$

$$= \frac{1}{3} \pi \times \frac{H}{H} (h_1) (R^2 + r^2 + Rr)$$

(using i)

$$= \pi (RL - rl)$$

$$= \pi (R \times \frac{rL}{r} - rl) \text{ using (iii)}$$

$$= \pi l (R - r)$$

$$= \pi l (R - \frac{rL}{L})(R + r)$$

$$= \frac{\pi l}{r} (R - r)(R + r)$$

$$= \frac{\pi l}{r} (R - \frac{rL}{L})(R + r)$$

using (iv)

$$= \frac{\pi l R}{r} (\frac{L - l}{L})(R + r)$$

$$= \pi \times L (\frac{l_1}{L})(R + r)$$

using (iii)

$$= \pi l_1 (R + r)$$

③ total surface area of frustum

$$= \pi l_1 (R + r) + \pi r^2 + \pi R^2$$

④ $l_1 = \sqrt{h_1^2 + (R - r)^2}$