**Q)*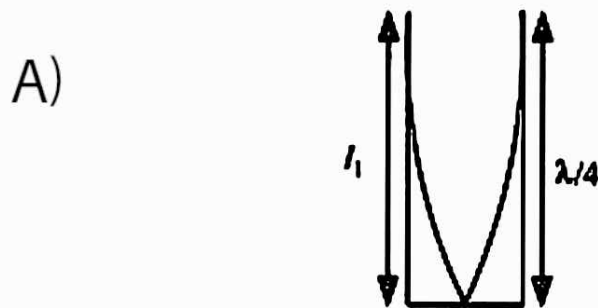* A metre-long tube open at one end, with a movable piston at the other end, shows resonance with a fixed frequency source (a tuning fork of frequency 340 Hz) when the tube length is 25.5 cm or 79.3 cm. Estimate the speed of sound in air at the temperature of the experiment.

A)

Frequency of the turning fork,
$f = 340\ Hz$

Since the given pipe is attached with a piston at one end, it will behave as a pipe with one end closed and the other end open, as shown in the given figure. Such a system produces odd harmonics. The fundamental note in a closed pipe is given by the relation:

$l_1 = \lambda/4$

where,
length of pipe,
$l_1 = 25.5cm = 0.255m$
$\lambda = 4l_1 = 4 \times 0.255 = 1.02\ m$

The speed of the sound is given by the relation:

$v = f\lambda = 340 \times 1.02 = 346.8\ m/s$