Optics and Waves (week 3)

Wavelength of the fundamental is

a) $\lambda = 4L$, L = 1.3 - 0.1 = 1.2 m.

$$f_1 = \frac{v}{\lambda} = \frac{v}{4L} = \frac{340}{4.8} = 70.83Hz$$

b) Higher modes are given by

$f_n = (2n+1)f_1$ (n = 1, 2, 3 ....)

To find the maximum resonant frequency, need to find the highest value of *n* possible, considering that the maximum available frequency is 5 kHz. i.e. we need to find what n gives an f_n that is very close but below 5 kHz and f_{n+1} exceeds 5 kHz.

$$(2n+1) = \frac{5000}{70.83} = 70.95$$

But *2n + 1* must be an odd integer, so take next smallest odd integer which is 69.

So $f_{\max} = 69 f_1$ =4887.3 Hz

c) Number of resonant modes the value of *n* for which *2n + 1* = 69 plus the fundamental, i.e. 34 + 1 = 35.