

(ii) what fraction of all resonances would this resistor then suppress?

It will suppress $2/3$ of all of the resonances of the initial line. Since we must now have a zero at $L/3$ from the open end of the line, it is as if the line is only one third as long, so the (low-loss) resonances are three times as far apart as those on the original line. All the other resonances of the original line are suppressed.

(e) What would happen to the resonances on the line in case (a) above (both ends open circuit) if I cut a very small gap in the electrical conductors in the middle of the line?

For a very small gap, it is as if we put large capacitors connecting two pieces of transmission line, and such capacitors behave as short-circuits for oscillating voltages, so there is no effect on the resonances of the line for a very small gap. It is also true that there will simply be wave coupling between the different parts of the line (which is not really a separate statement from the capacitive coupling).

As the gap size is increased, the break does become a significant, and in the limit of a large gap, the two parts of the line will behave as if they are separate lines of half the length.