Consider the schematic diagram of a RLC bandpass filter circuit shown in Figure. 01. The bandpass circuit is designed with a resistor (R), capacitor (C) and inductor (L). The output terminal, V_{out} of this RLC circuit is taken across the parallel branch of C and L. The magnitude response of this RLC filer is:

$$|H(j\omega)| = \left|\frac{V_{out}}{V_{in}}\right| = \frac{\omega L}{\sqrt{R^2(1-\omega^2 LC)^2 + (\omega L)^2}}$$

Where $\omega = angular\ frequency\ \left(\frac{rad}{sec}\right)$

Now write down a program code in C which will perform the following tasks:

(i) The C program will take the values of R, L and C for the circuit diagram shown in Figure. 01.

(ii) After the analysis of the equation of $|H(j\omega)|$, we have found that the maximum value of $|H(j\omega)| = 1$ is achieved at

$$f_{peak} = \frac{1}{2\pi\sqrt{LC}}$$

Your C program will calculate the value of f_{peak} in hertz (Hz) with the entered values of R, L, C and will display it.

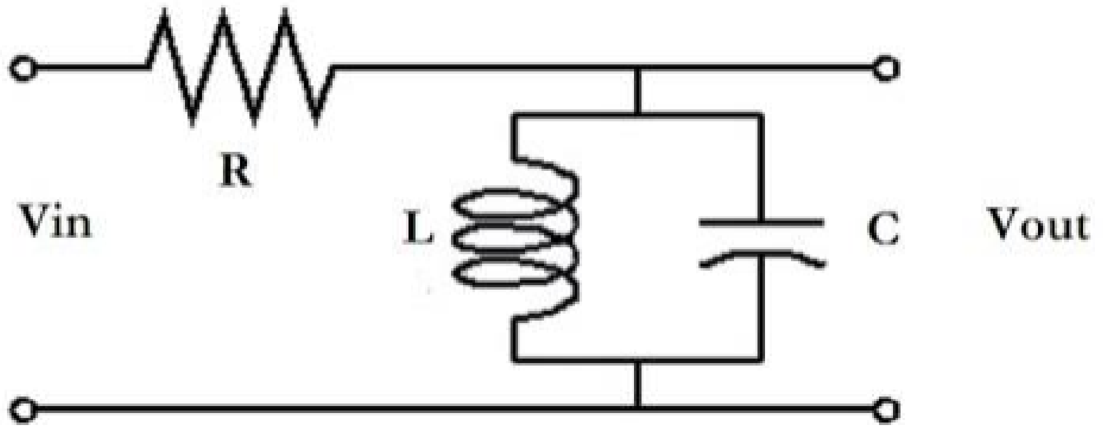

Figure : 01.

(iii) Now we want to plot a $|H(j\omega)|\ vs\ \omega$ curve (magnitude response curve of the RLC filter) for a particular range of frequency. So, we need to calculate the values of $|H(j\omega)|$ for different frequencies by using your C program code. At first, your program will take two different values of frequency, f in hertz (Hz) for the upper limit and lower limit of the frequency range as inputs.

(iv) Finally, use a while/do-while loop to compute the values of $|H(j\omega)|$ for different frequencies starting from the lower limit of the frequency range with a 0.5 Hz increment. Then display all the values of $|H(j\omega)|$ sequentially on the console window. Remember the relation between angular frequency and frequency is: $\omega = 2\pi f$.