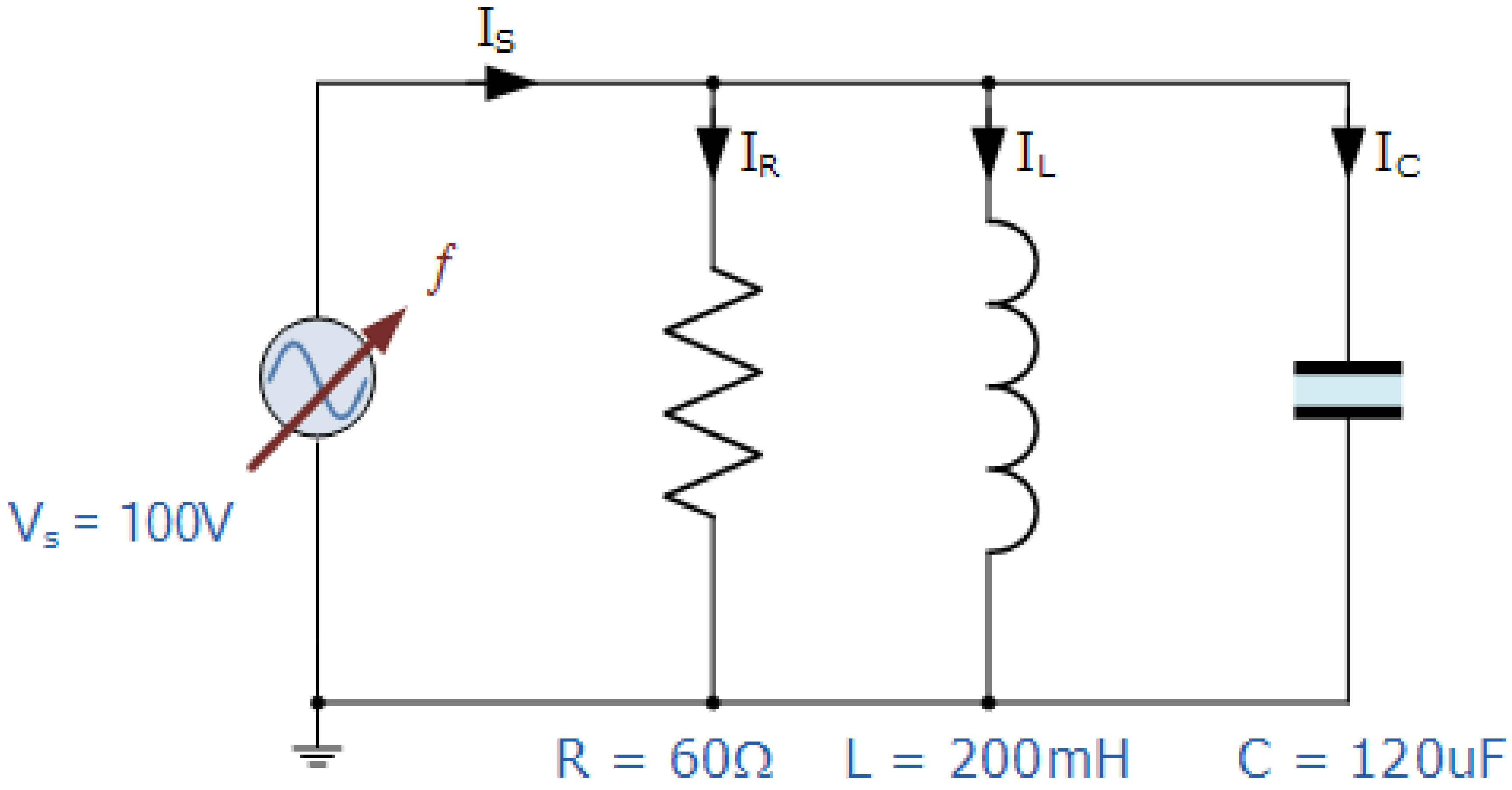
# Chapter:6

(Understand the effect of Bandwidth & Q-factor in parallel Resonance)

Lecture-1

# Definition of the effect of Bandwidth & Q-factor in parallel Resonance

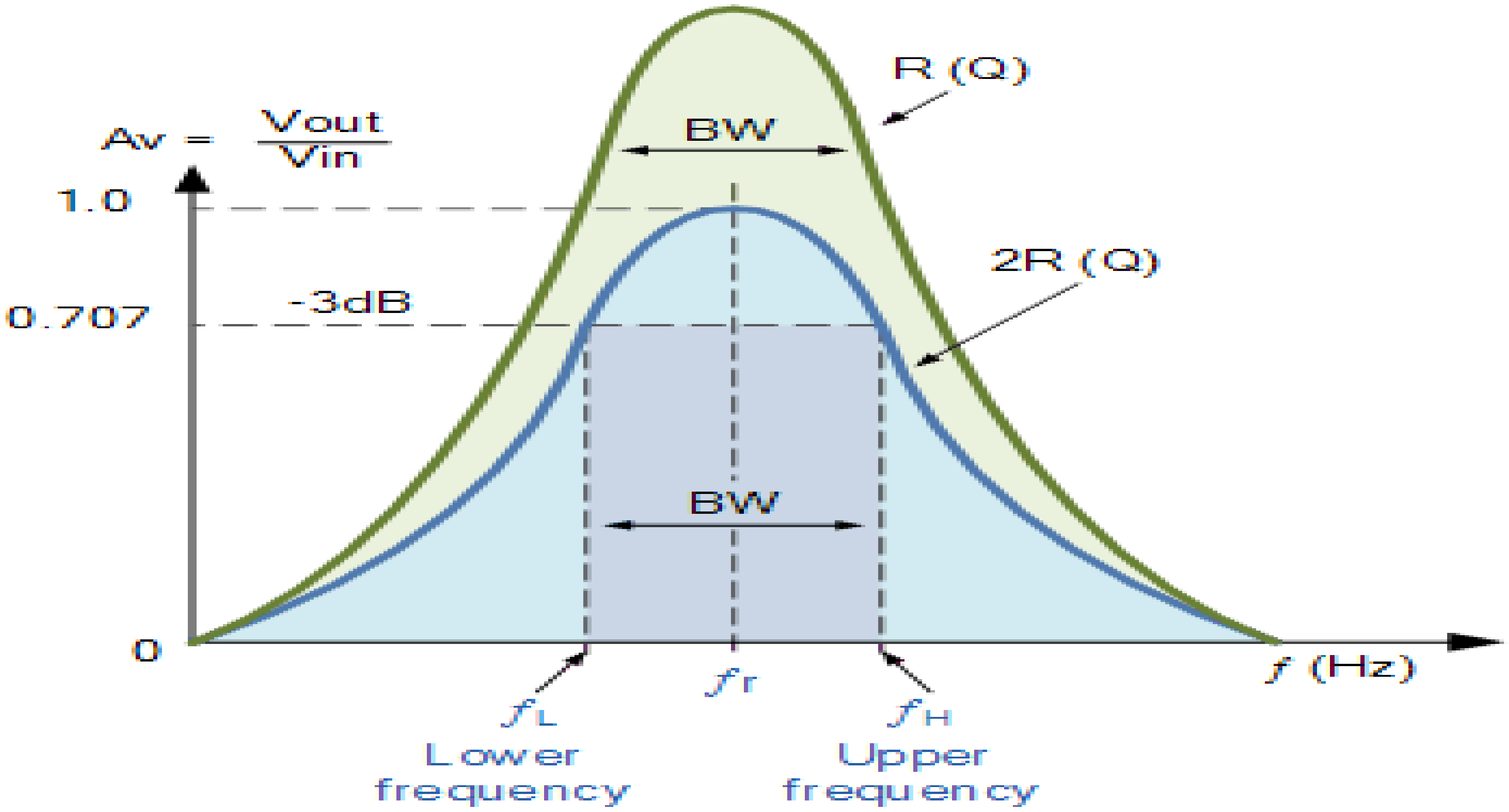
- Bandwidth:
- Bandwidth of a Parallel Resonance Circuit;
- The bandwidth of a parallel resonance circuit is defined in exactly the same way as for the series resonance circuit. The upper and lower cut-off frequencies given as: upper and lower respectively denote the half-power frequencies where the power dissipated in the circuit is half of the full power dissipated at the resonant frequency 0.5( I2 R ) which gives us the same -3dB points at a current value that is equal to 70.7% of its maximum resonant value, ( 0.707 x I )2 R


$I_S$
$I_R$
$I_L$
$I_C$
$f$
$V_s$ = 100V
R = 60Ω
L = 200mH
C = 120uF

- Q-Factor:
- if the resonant frequency remains constant, an increase in the quality factor, Q will cause a decrease in the bandwidth and likewise, a decrease in the quality factor will cause an increase in the bandwidth as defined by:
- BW = fr /Q or BW = fupper - flower
- Also changing the ratio between the inductor, L and the capacitor, C, or the value of the resistance, R the bandwidth and therefore the frequency response of the circuit will be changed for a fixed resonant frequency. This technique is used extensively in tuning circuits for radio and television transmitters and receivers.
- The selectivity or Q-factor for a parallel resonance circuit is generally defined as the ratio of the circulating branch currents to the supply current and is given as:

- Q-factor for a parallel resonance circuit:

- Note that the Q-factor of a parallel resonance circuit is the inverse of the expression for the Q-factor of the series circuit. Also in series resonance circuits the Q-factor gives the voltage magnification of the circuit, whereas in a parallel circuit it gives the current magnification.



Av = Vout / Vin
1.0
0.707
-3dB
0
BW
BW
R (Q)
2R (Q)
f (Hz)
fL
Lower frequency
fr
fH
Upper frequency