Q- A series AC circuit contains the following components: R = 150 Ohm, L = 250 mH, C = 2.00 micro-Farad and a source with V_{max} = 210v operating at 50.0 Hz. Calculate the

a) Inductive reactance

The inductive reactance of a circuit having inductance L is given by

$$X_L = L\omega = 250*10^{-3}*2*3.1416*50 = 78.54\Omega$$

b) Capacitive reactance

The capacitive reactance of the circuit will be

$$X_C = \frac{1}{C\omega} = \frac{1}{C*2\pi f} = \frac{1}{2.00*10^{-6}*2*3.1416*50.0} = 1591.55\Omega$$

c) Impedance

The impedance of the circuit is given by

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

Or $\quad Z = \sqrt{150^2 + (78.54 - 1591.55)^2} = 1513.00\Omega$

d) Maximum current

The maximum current will be

$$I_{max} = \frac{V_{max}}{Z} = \frac{210}{1513.00} = 0.1388A$$

e) Phase angle between source voltage **and current**

The phase difference between the voltage and the current is given by

$$\tan\phi = \frac{(X_L - X_C)}{Z} = \frac{-1513.00}{1520.43} = -0.995$$

Or $\quad \phi = -44.86^0$

Capacitive reactance is greater than inductive reactance hence the voltage is lagging behind the current by 44.86^0 or the current is leading the voltage by 44.86^0.