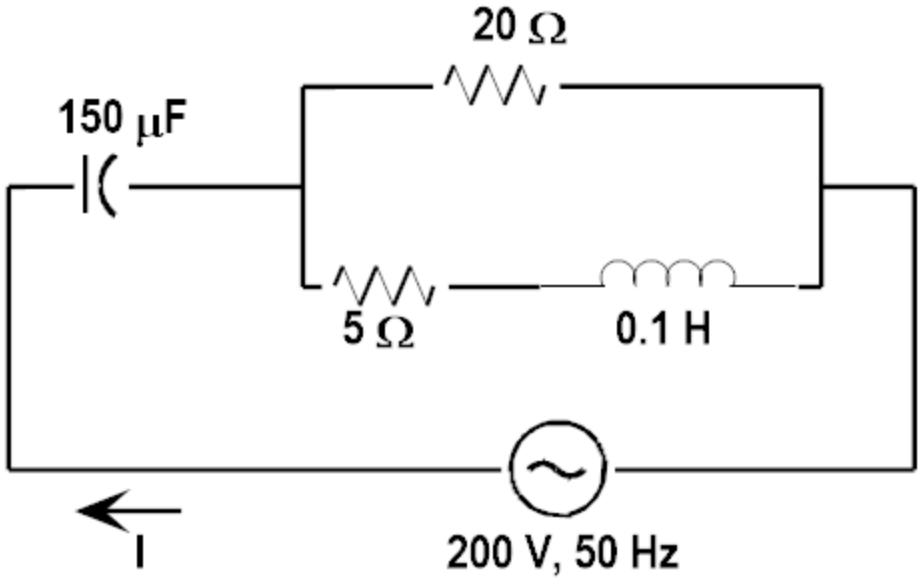
# Basic Electrical Technology

[ELE 1051]

***SINGLE PHASE AC CIRCUITS***

# Homework 1

For network shown below, calculate the value of current I and the voltage across the parallel branch.




Ans:

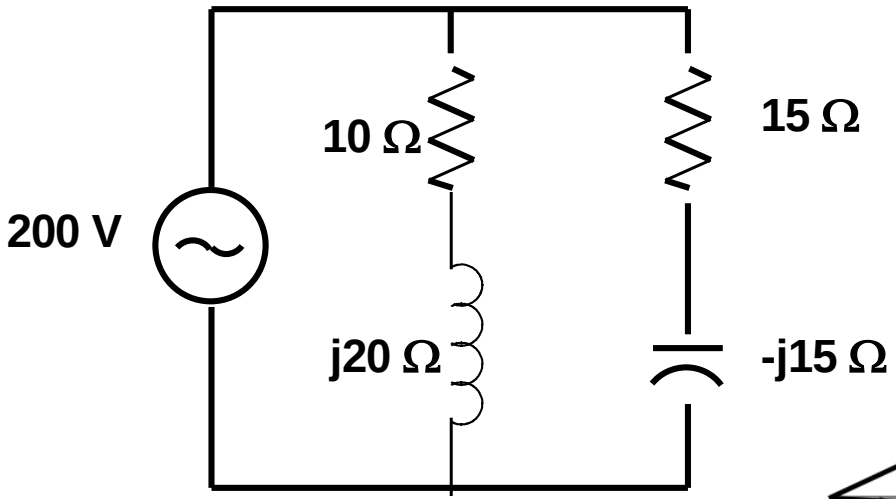
$Z_{eq}$=19.25∠-44.22° Ω=13.79-j13.42 Ω

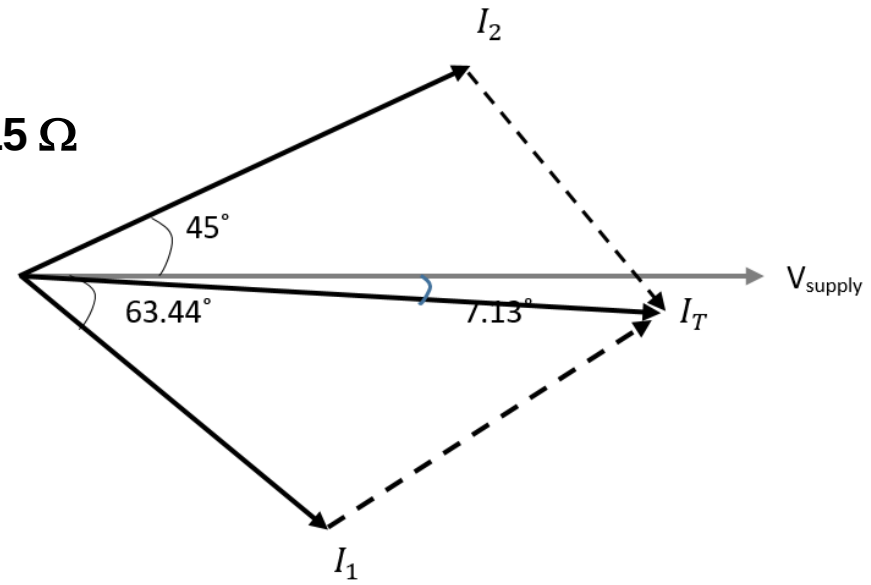
I=10.39∠+44.22° A=7.45+j7.25 A

$V_{parallel}$=164.64∠73.68 V=46.26+j158.01 V

# Homework 2

For network shown, find the two branch currents and the total current. Also sketch the phasor diagram taking source voltage as reference




**Ans:**

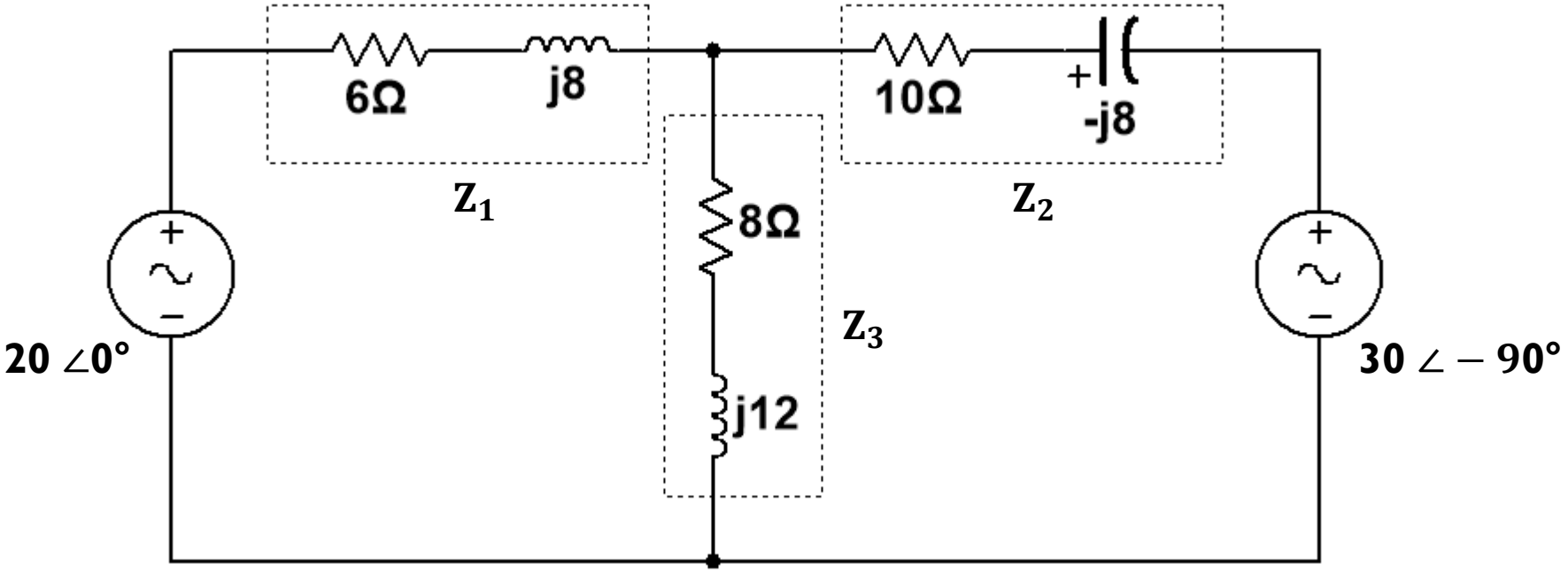
$I_1 = 8.95\angle -63.44° \text{ A} = 4 - \text{j}8 \text{ A}$

$I_2 = 9.43\angle 45° \text{ A} = 6.67 + \text{j}6.67 \text{ A}$

$I_T = 10.75\angle -7.125° \text{ A} = 10.67 - \text{j}1.33 \text{ A}$

# Homework 3

For the circuit shown, determine the current through the impedance $Z_3$ using mesh current analysis

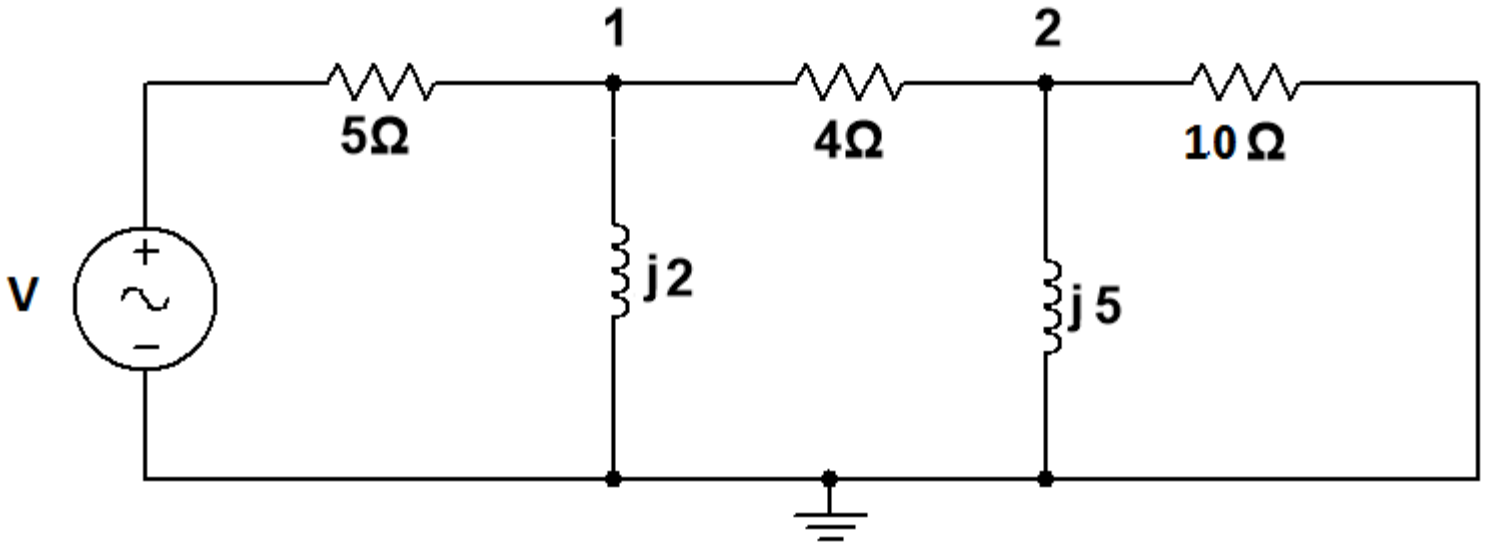



**Ans:**

$I_3 = 1.65\angle -79.3°$ A

# Homework 4

In the circuit shown obtain the voltage ratio $V_1 / V_2$ by application of Node Voltage Method




**Ans:**

$V_1 / V_2 = 1.61\angle -29.8°$ V

# Homework 5

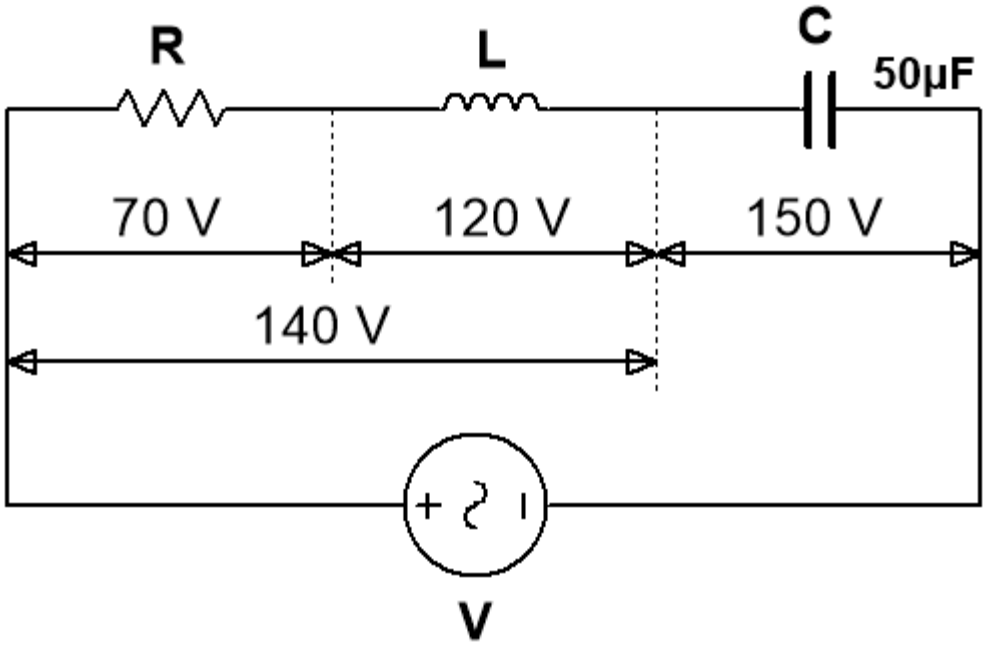
A coil of resistance R and inductance L is connected in series with a 10 Ω resistor and an AC sinusoidal voltage of 36 V, 60 Hz is applied across it. Find the value of R & L if the voltage across the 10 Ω resistor is 20 V and that across the coil is 22.4 V

Ans:

$$\mathbf{L = 26.68mH}$$

# Homework 6

The current flowing through the circuit is 2.355A. If the voltages are as indicated, find the applied voltage, frequency and the loss in the iron cored choke coil L




Ans:
V=78.136V
$P_{COIL}$=5.0397W
f=50Hz

# Homework 7

Two circuits having the same numerical impedances are connected in parallel. The power factor of one circuit is 0.8 lag and of the other is 0.6 lag. Find the power factor of the combination.

**Ans: 0.707 lag**

# Homework 8

Two electric devices A and B are connected in parallel. The current in A is 15A and current in B lags behind the current in A by 60°. Determine the current in B if the total current is 23.4 A.

**Ans: 11.96A**

# Homework 9

Two impedances $Z_A$ and $Z_B$ are connected in parallel across a 115V, 50Hz supply. The total current taken by the combination is 10A at unity p.f. $Z_B$ has resistance of 10Ω and 200μF capacitor connected in series. $Z_A$ consists of a resistor and inductor is series. Find

(a) The current in each branch

(b) The resistance and inductance of $Z_A$

**Ans: $I_A = 8.51\angle -38.07°$ A, $I_B = 6.12\angle 57.84°$ A, $R_A = 10.65\Omega, L_A = 0.026$H**

# Homework 10

An coil in parallel with a 100μF capacitor is connected across a 230V, 50Hz single phase AC supply. The coil takes a current of 4A and the power loss in the coil is 600W. Calculate the (i) The resistance of the coil (ii) The inductance of the coil and (iii) the power factor of the entire circuit.

**Ans: $R = 37.5\Omega, L = 0.1387H$, Pf = 0.528 lead**