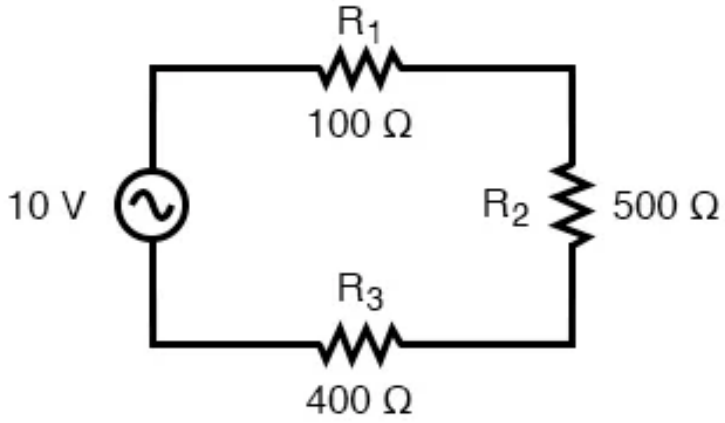
PRACTICE – Simple circuit

Q) Find the voltage drop across each resistor in the circuit given.



$$I = \frac{V}{R_{eq}}$$

$$R_{eq} = 100 + 500 + 400 = 1000\Omega(1k\Omega)$$

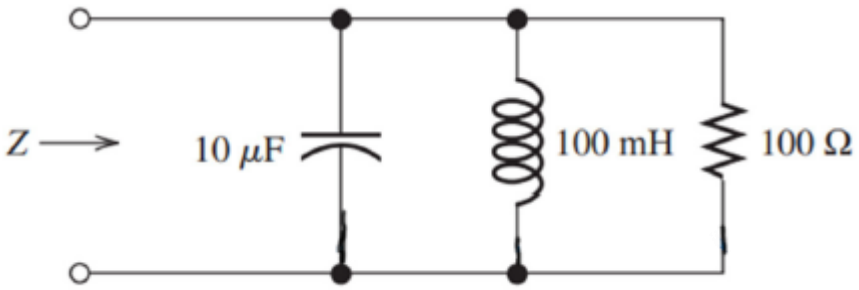
Series circuit – current same

$$I = \frac{10}{1000} = 0.01A = 10mA$$

$$V_{R1} = I \times R_1 = 1V \qquad V_{R2} = I \times R_2 = 5V \qquad V_{R3} = I \times R_3 = 4V$$

PRACTICE – Complex impedances

Q) Find complex impedance of the network shown, take ω = 500 rad/s



$$R_{eq} = \frac{1}{(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3})}$$

$$Z_{eq} = \frac{1}{(\frac{1}{R} + \frac{1}{Z_C} + \frac{1}{Z_L})}$$

$$Z_C = \frac{-j}{\omega C} = \frac{-j}{500 \times 10 \times 10^{-6}} = -200j$$

$$Z_L = j\omega L = j \times 500 \times 100 \times 10^{-3} = 50j$$

$$Z_{eq} = \frac{1}{(\frac{1}{100} - \frac{1}{200j} + \frac{1}{50j})}$$

=1/(1/100-1/200i+1/50i)

$$Z_{eq} = 30.76 + 46.15j$$

PRACTICE – Charge current relations

Q) The current through a certain circuit element is given by $i(t) = 4e^{-t} A$.

Find the net charge that passes through that element in time interval t=0 to t= ∞

$$q(t) = \int_{t_0}^{t} i(t)\,dt + q(t_0)$$

$$i(t) = \int_{0}^{\infty} 4e^{-t} dt + 0$$

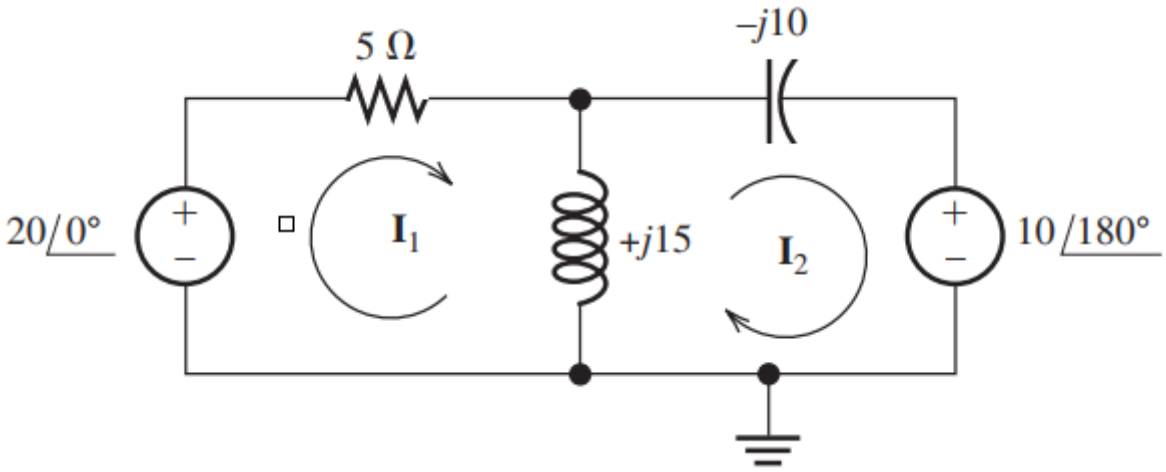
$$i(t) = -4\left[e^{-t}\right]_{0}^{\infty}$$

$$i(t) = -4\left(\frac{1}{e^{\infty}} - \frac{1}{e^{0}}\right) = -4\left[0 - 1\right]$$

$$Ans: q(t) = 4C$$

PRACTICE-
Circuit Analysis with complex impedances

MESH CURRENT ANALYSIS



@Loop1

$$-20\angle 0 + I_1(5) + (I_1 - I_2)$$

$$(5+15j)I_1 - (15j)I_2 = 20\angle 0$$

@Loop2

$$10\angle 180 + (I_2 - I_1)15j + I_2(-10j) = 0$$

$$-15jI_1 + 5jI_2 = -10\angle 180$$

```
>> a=[5+15*j -15j;-15j 5j]

>> b=[20;10]

>> inv(a)*b
```

$$I_1 = 0.27 + 1.62i$$

$$I_2 = 0.81 + 2.86i$$