ELEMENTS OF ELECTRICAL ENGINEERING
Course Code : UE25EE141A/B

PES UNIVERSITY

FACULTY CONTRIBUTED:

Department of EEE, RR Campus

Prof . Jyothi T N
Prof. Vadhiraj K P P
Prof. Kruthika N
Prof. Suma S
Prof. Pushpa K R
Prof. Sangeeta Modi

Department of ECE, EC Campus

Prof. Lokesh L
Prof. Dhanashree G Bhate
Dr. Renuka R Kajur
Prof. Rajesh Chandrashekar
Prof. Sangam Kumar G H

ELEMENTS OF ELECTRICAL ENGINEERING (UE25EE141A/B)

Analysis of Series-Parallel AC Circuits

Jyothi T N
Department of Electrical & Electronics Engineering

Series – Parallel AC Circuits

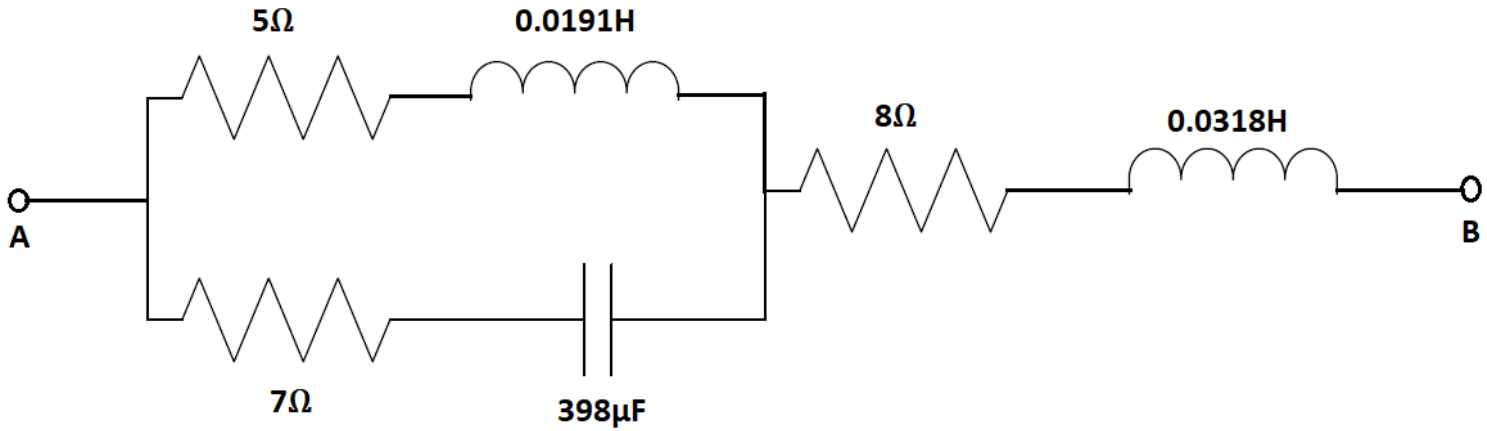
Series - Parallel AC Circuits are those in which few elements are connected in series and few elements are connected in parallel.

It is always advisable to solve such networks using Phasor Method.

While applying Phasor method for Series – Parallel AC circuits, consider any known quantity as reference.

Numerical Example

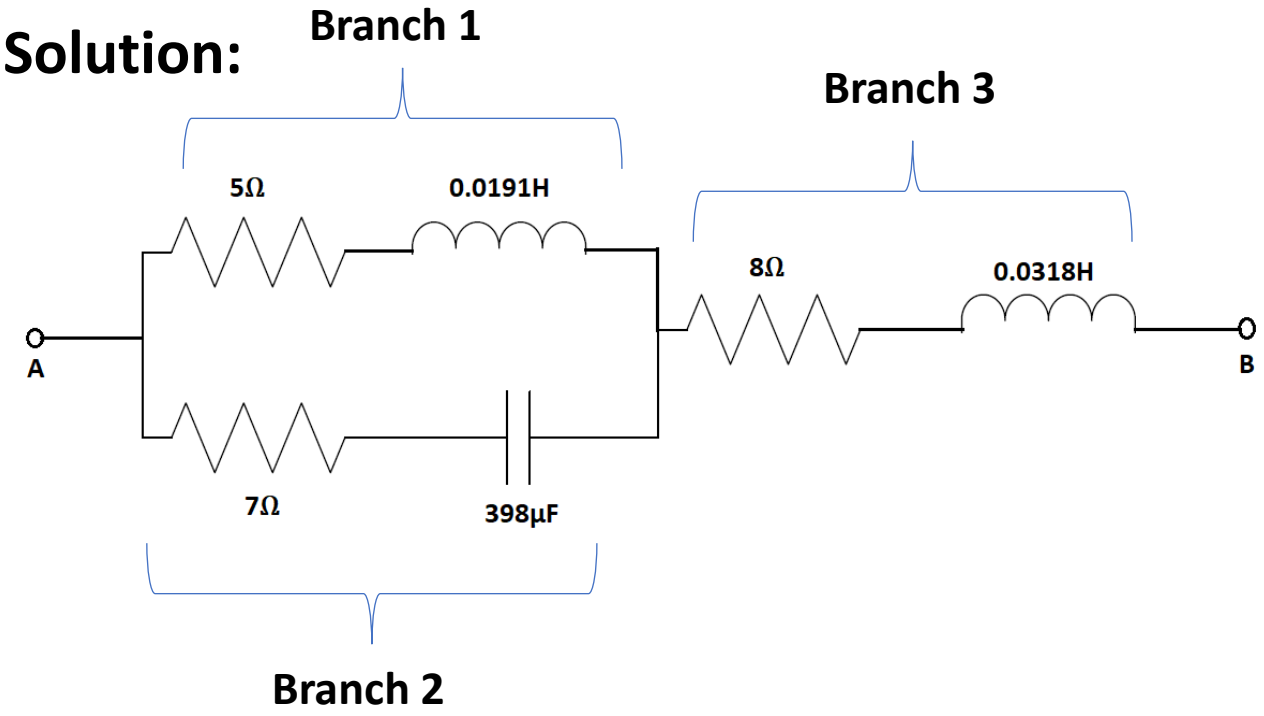
Question:



In the circuit shown, what voltage of 50Hz frequency is to be applied across A & B that will cause a current of 10A to flow in the capacitor. Also draw the phasor diagram representing the circuit.

Numerical Example

Solution:



Branches 1 & 3 : Series RL branches

$\Rightarrow Z_1 = (R_1 + jX_{L1}) = 5+j(2\pi*50*0.0191) = (5+j6)\Omega$

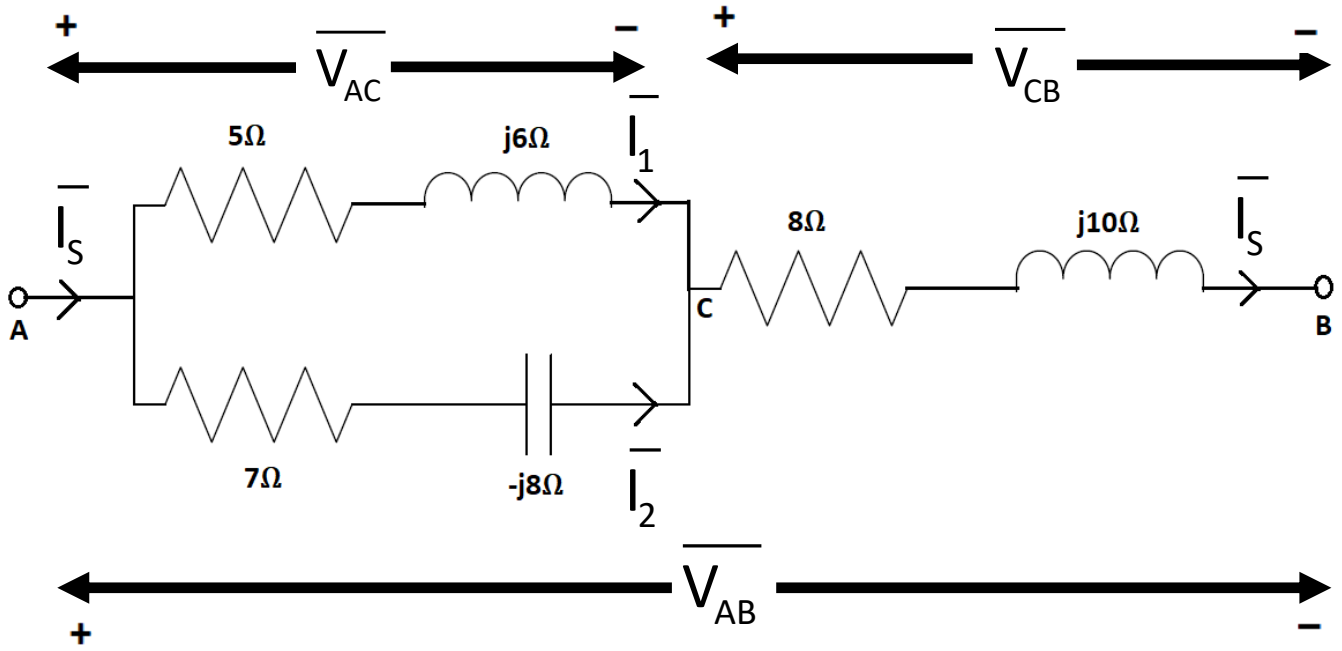
Similarly, $Z_3 = (8+j10)\Omega$

Branch 2 : Series RC branch

$\Rightarrow Z_2 = (R_2 - jX_{C2}) = (7-j8)\Omega$

Numerical Example

Solution (Continued..) :



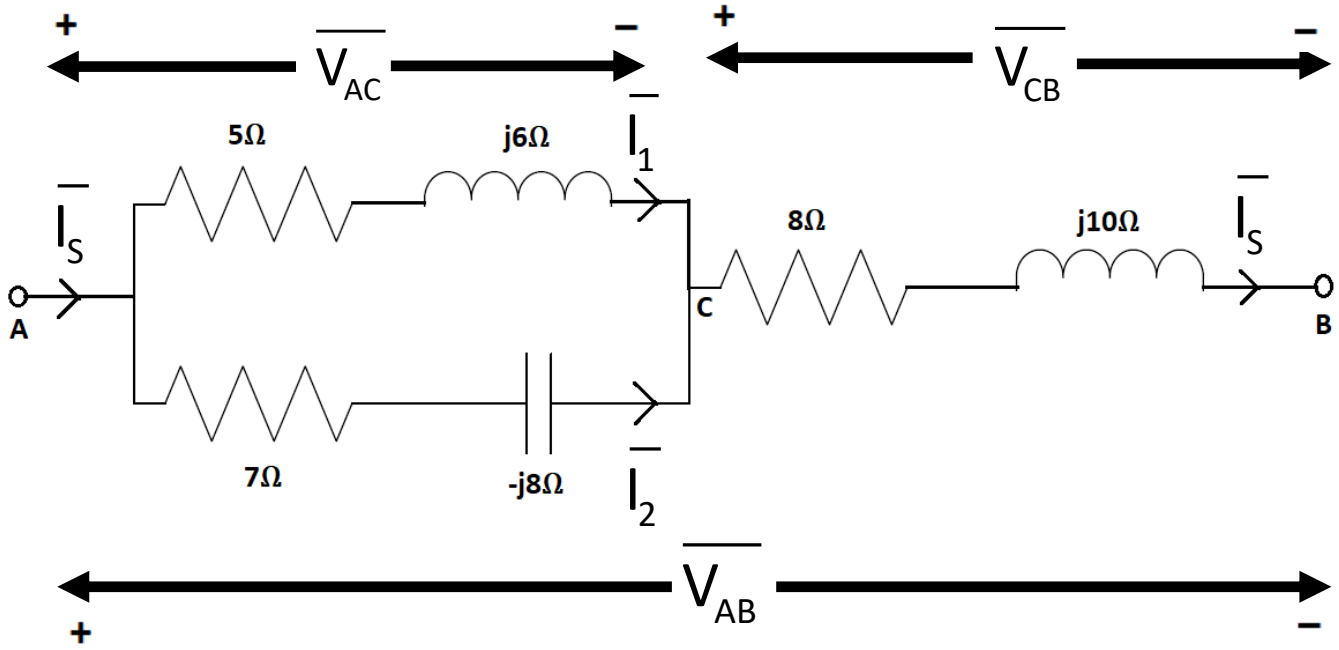
Since current through the capacitor is known, let us take it as reference phasor.

Therefore, $\overline{I_2} = 10\angle 0°\text{A}$

Hence, $\overline{V_{AC}} = \overline{I_2} * Z_2 = 10\angle 0° * (7\text{-}j8) = 106.3\angle -48.81°\text{V}$

Numerical Example

Solution (Continued..) :



$$\text{Therefore, } \overline{I_1} = \frac{\overline{V_{AC}}}{Z_1} = 13.61\angle -99°\text{A}$$

$$\Rightarrow \overline{I_S} = \overline{I_1} + \overline{I_2} = 15.58\angle -59.65°\text{A}$$

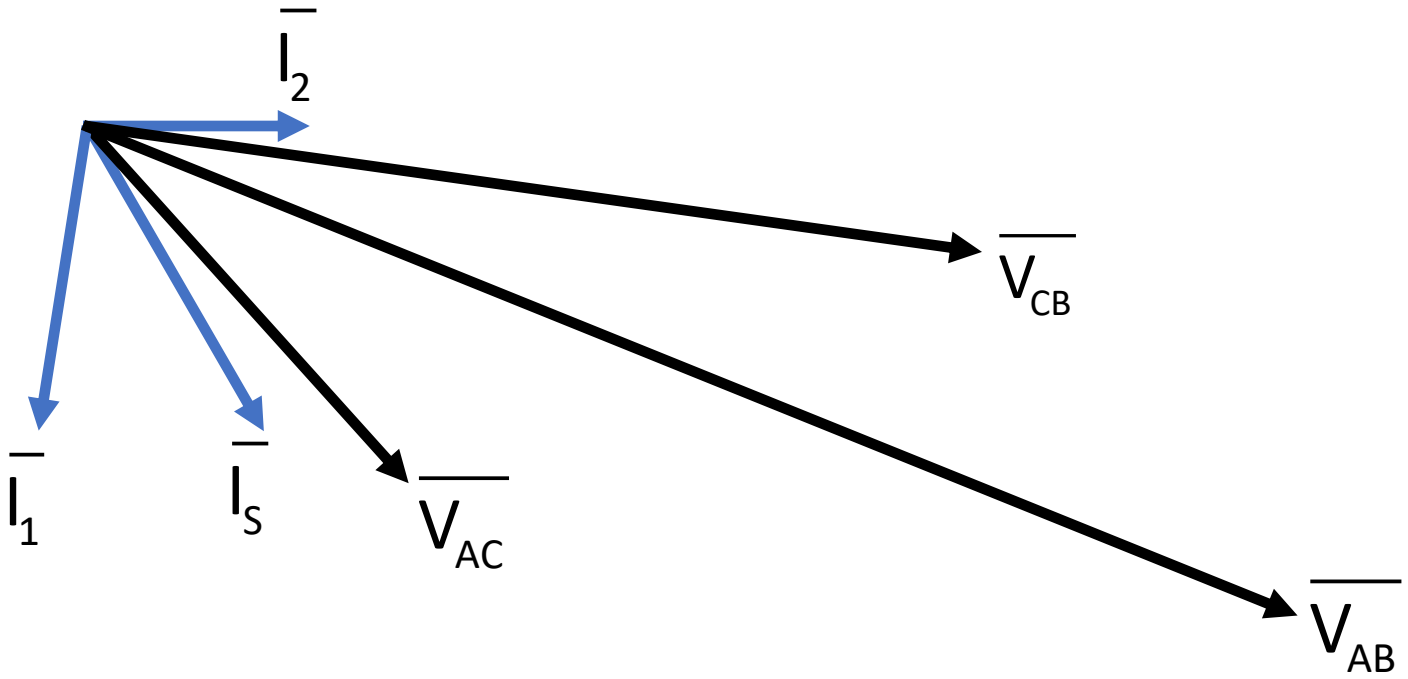
$$\text{Now, } \overline{V_{CB}} = \overline{I_S} * Z_3 = 199.48\angle -8.31°\text{V}$$

Numerical Example

Solution (Continued..) :

Therefore, $\overline{V_{AB}} = \overline{V_{AC}} + \overline{V_{CB}} = 288.69\angle -22.15°V$

Phasor Diagram :



ELEMENTS OF ELECTRICAL ENGINEERING

Text Book & References

Text Book:

1. "Basic Electrical Engineering" S.K Bhattacharya, 1st Edition Pearson India Education Services Pvt. Ltd., 2017
2. "Basic Electrical Engineering", D. C. Kulshreshta, 2nd Edition, McGraw-Hill. 2019
3. "Special Electrical Machines" E G Janardanan, PHI Learning Pvt. Ltd., 2014

Reference Books:

1. "Engineering Circuit Analysis" William Hayt, Jack Kemmerly, Jamie Phillips and Steven Durbin, 10th Edition McGraw Hill, 2023

2. "Electrical and Electronic Technology" E. Hughes (Revised by J. Hiley, K. Brown & I.M Smith), 12th Edition, Pearson Education, 2016.

THANK YOU

Jyothi T.N
Department of Electrical & Electronics Engineering
jyothitn@pes.edu