



ELEMENTS OF ELECTRICAL ENGINEERING

Course Code : UE25EE141A/B

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ELEMENTS OF ELECTRICAL ENGINEERING (UE25EE141A/B)

Numericals on Parallel AC Circuits

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Numerical Example 1

Question:

A resistor of 30Ω and a capacitor of unknown value are connected in parallel across a 110V, 50Hz Supply. The combination draws a current of 5A from the supply. Find the value of unknown Capacitance.

Numerical Example 1 - Solution

Solution:

$$|Y_T| = \frac{|I|}{|V|} = \frac{5}{110} = 0.045 \text{ S} \quad \text{----- (1)}$$

$$\text{For a parallel RC network, } |Y_T| = \sqrt{G^2 + B_C^2} \quad \text{----- (2)}$$

$$G = \frac{1}{R} = 0.033 \text{ S}$$

Substituting G in (2) and equating (1) & (2),

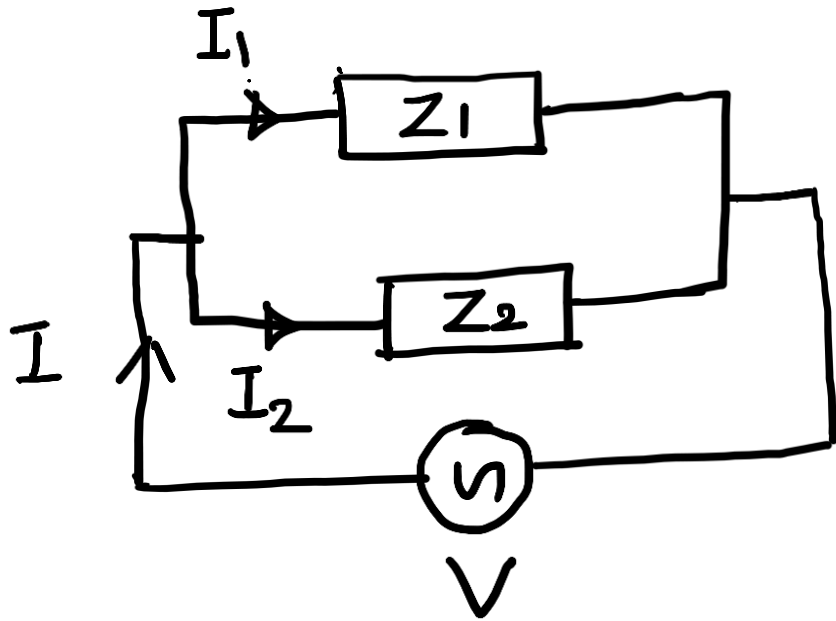
$$B_C = 0.0306 \text{ S}$$

$$C = \frac{B_C}{\omega} = \frac{0.0306}{100\pi} = 97.38 \mu\text{F}$$

Numerical Example 2

Two circuits, the impedances of which are given by $Z_1 = (6 + j8) \Omega$ and $Z_2 = (8 - j6) \Omega$ are connected in parallel. If the applied voltage to the combination is 100 V, find (i) current and pf of each branch, (ii) overall current and pf of the combination, and (iii) power consumed by each impedance.

Numerical Example 2



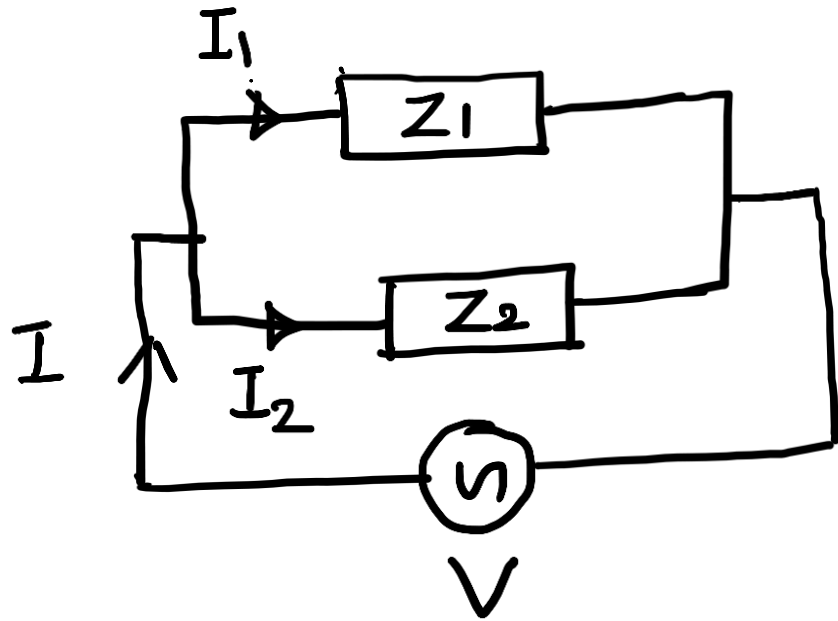
$$Z_1 = 6 + j8 \Omega, \quad Z_2 = 8 - j6 \Omega$$

$$\vec{V} = 100 \angle 0^\circ$$

$$\vec{I}_1 = \frac{\vec{V}}{Z_1} = \frac{100 \angle 0^\circ}{6 + j8} = 10 \angle -53.13^\circ$$

$$\vec{I}_2 = \frac{\vec{V}}{Z_2} = \frac{100 \angle 0^\circ}{8 - j6} = 10 \angle 36.9^\circ$$

Numerical Example 2



$$\cos \phi_1 = \cos(53.13) = 0.6 \text{ lagging}$$

$$\cos \phi_2 = \cos(36.9) = 0.8 \text{ leading}$$

$$\vec{I}_T = \vec{I}_1 + \vec{I}_2$$

$$= 10 \angle -53.13 + 10 \angle 36.9$$

$$I_T = 14.14 \angle -8.13 \text{ A}$$

Overall Pf $\cos \phi = \cos(8.13) = 0.989 \text{ lagging}$

$$P_1 = I_1^2 R_1 = (10^2) 6 = 600 \text{ W}$$

$$P_2 = I_2^2 R_2 = (10^2) 8 = 800 \text{ W}$$

Text Book & References

Text Book:

1. “Basic Electrical Engineering” S.K Bhattacharya, 1stEdition Pearson India Education Services Pvt. Ltd., 2017
2. “Basic Electrical Engineering”, D. C. Kulshreshta, 2ndEdition, 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

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