

電験革命

理論編

作成者：Lese



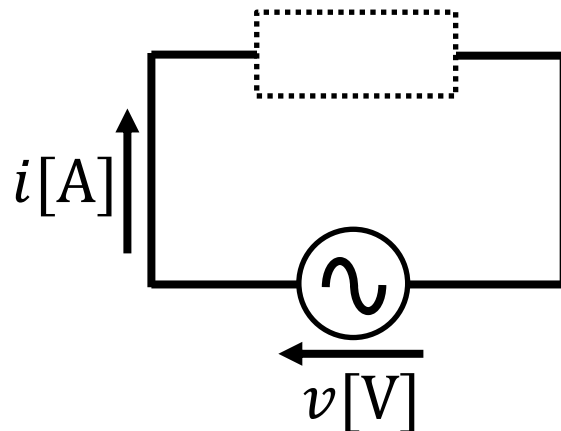
■ HW

□ に抵抗、コイル、コンデンサのいずれか一つの素子を入れると

$$v=628 \sin 628t$$

$$i=2 \sin \left(628t - \frac{\pi}{2} \right)$$

となった。このときの、□ の素子および、その抵抗値、インダクタンス、静電容量のいずれかを求めよ。



【交流回路】18. 交流の直列回路



$$v=628 \sin 628t$$

$$i=2 \sin \left(628t - \frac{\pi}{2} \right)$$

$$2\pi f=628$$

$$6.28f=628$$

$$f=100[\text{Hz}]$$

$$X_L = \frac{628}{2}$$

$$X_L = 314[\Omega]$$

$$\omega L= 314[\Omega]$$

$$2\pi f L= 314[\Omega]$$

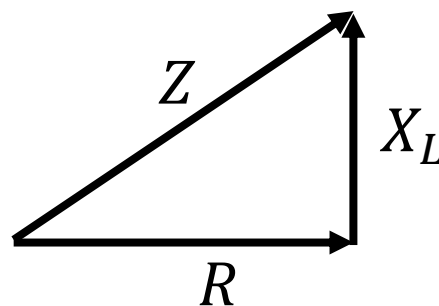
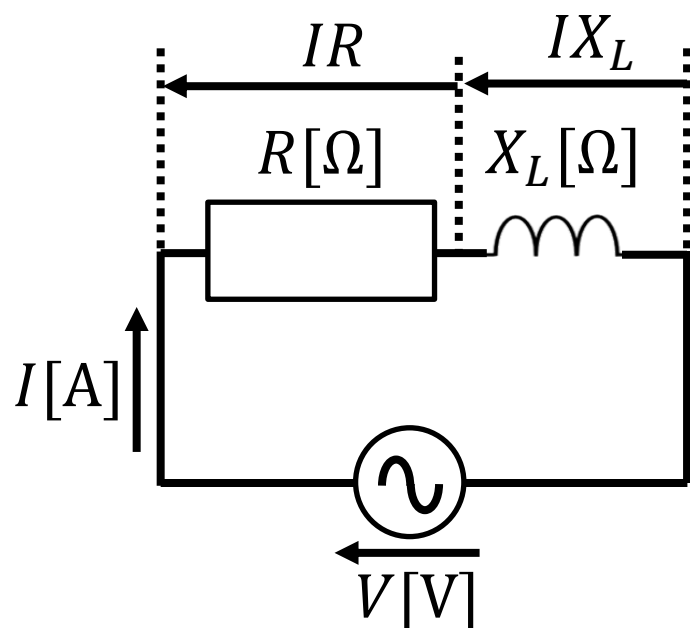
$$628 L= 314[\Omega]$$

$$L= 0.5[\text{H}]$$

A. コイル、0.5[H]

【RL直列回路】

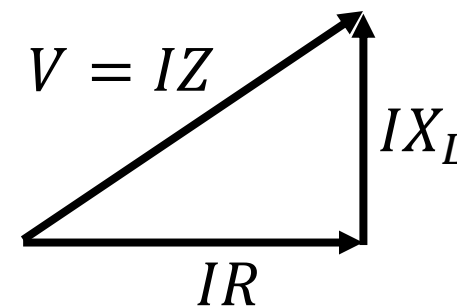
インピーダンス・・・回路全体の電流の通しにくさのこと。Zで表され、
単位は[Ω]



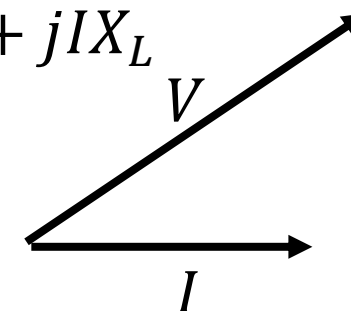
$$\dot{Z} = R + jX_L$$

$$Z = \sqrt{R^2 + X_L^2}$$

$$I = \frac{V}{Z}$$

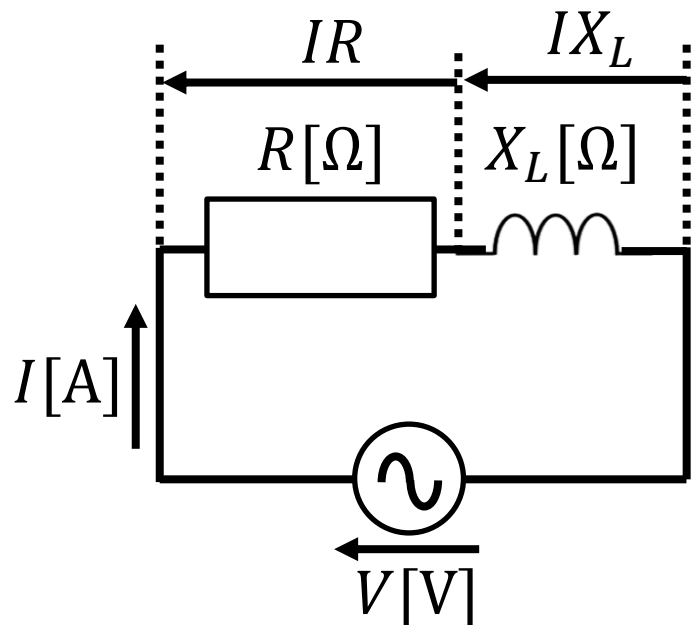


$$\dot{V} = IR + jIX_L$$

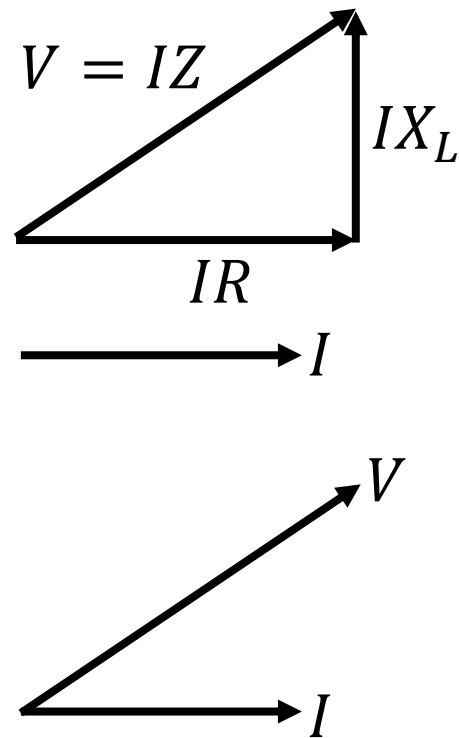


$$i = \frac{\dot{V}}{\dot{Z}}$$

【RL直列回路】

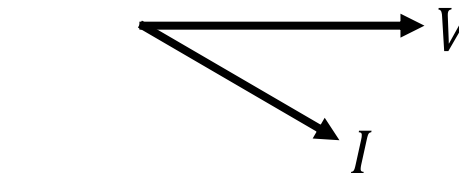


電流基準でのベクトル図



$$\dot{i} = \frac{\dot{V}}{\dot{Z}}$$

電圧基準でのベクトル図



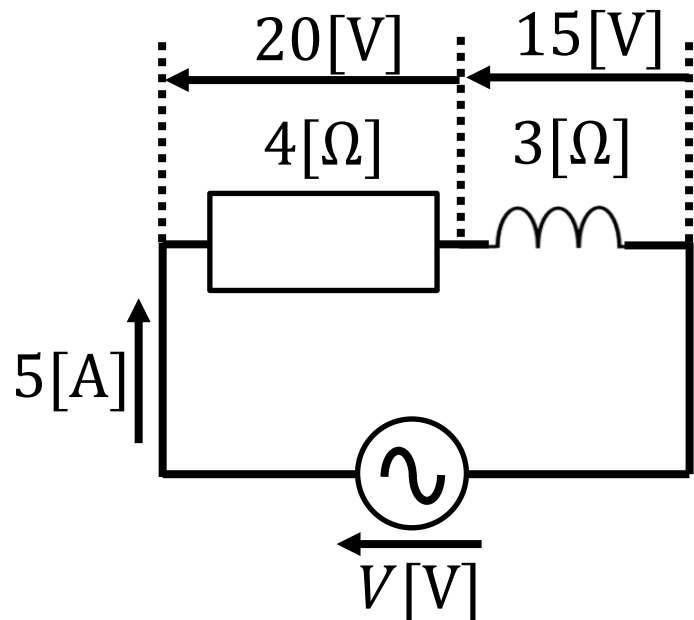
$$\dot{Z} = R + jX_L$$

$$\dot{i} = \frac{V}{R + jX_L}$$

$$\dot{i} = \frac{V(R - jX_L)}{R + X_L^2}$$

$$\dot{i} = \frac{VR}{R + X_L^2} - j \frac{VX_L}{R + X_L^2}$$

例題1



$$V = IZ$$

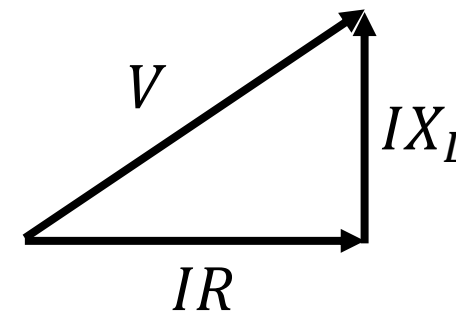
$$\dot{Z} = 4 + j3$$

$$Z = \sqrt{4^2 + 3^2}$$

$$Z = 5$$

$$V = 5 \times 5$$

$$V = 25$$

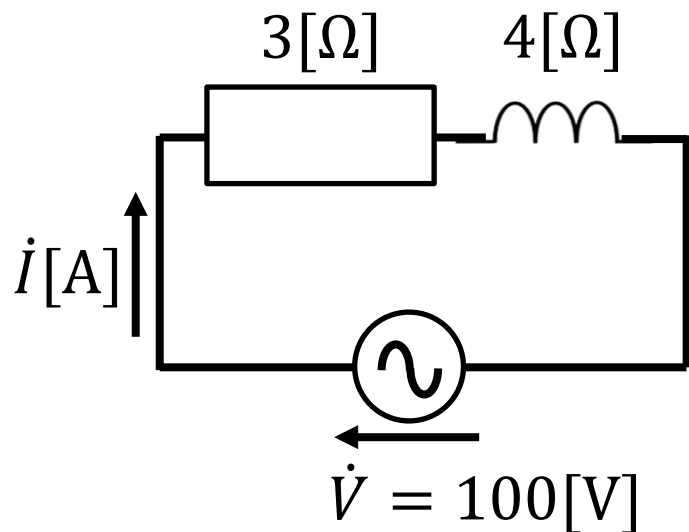


$$\dot{V} = 20 + j15$$

$$V = \sqrt{20^2 + 15^2}$$

$$V = 25$$

例題2



$$\dot{i} = \frac{\dot{V}}{\dot{Z}}$$

$$\dot{i} = \frac{100}{3 + j4}$$

$$\dot{i} = \frac{100(3 - j4)}{(3 + j4)(3 - j4)}$$

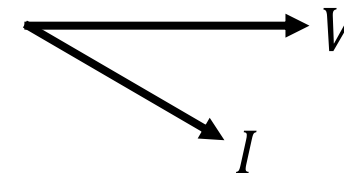
$$\dot{i} = 4(3 - j4)$$

$$\dot{i} = 12 - j16[\text{A}]$$

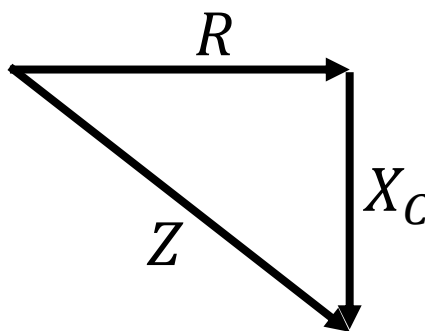
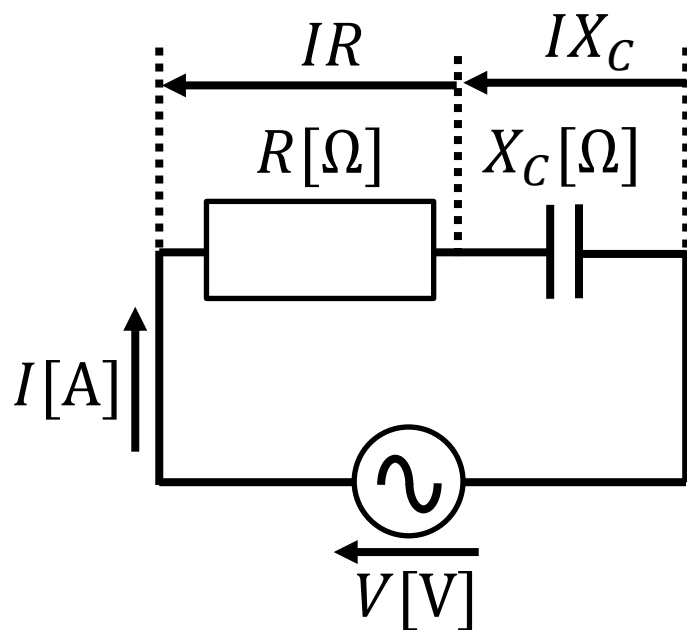
$$I = \sqrt{12^2 + 16^2}$$

$$I = 20$$

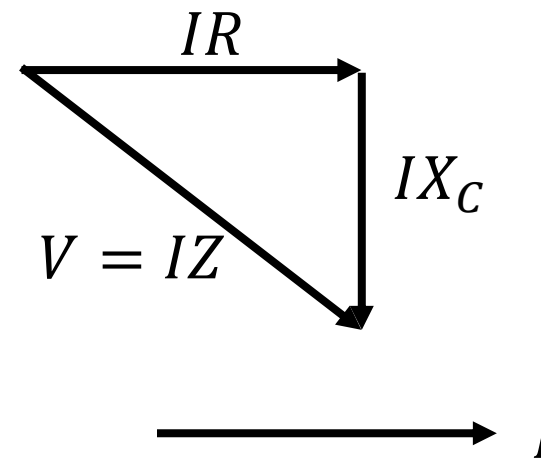
電圧基準でのベクトル図



【RC直列回路】



$$\dot{Z} = R - jX_C$$

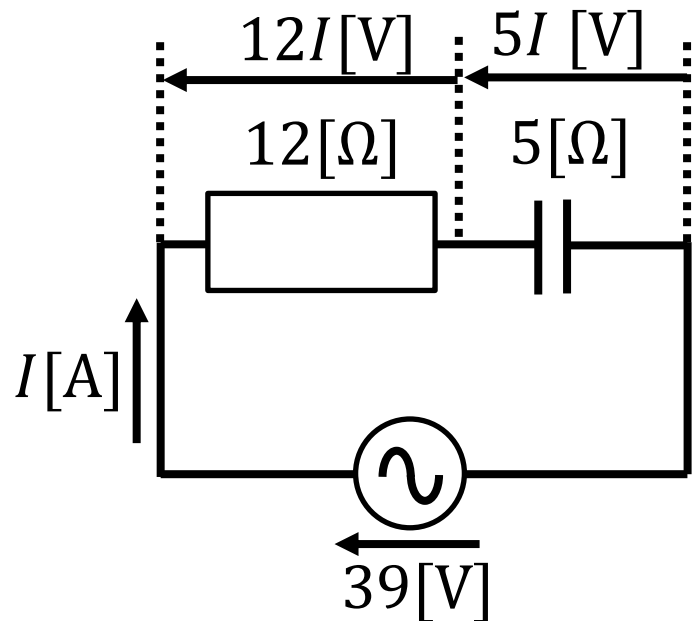


$$\dot{V} = IR - jIX_C$$

$$Z = \sqrt{R^2 + X_C^2}$$

$$I = \frac{V}{Z}$$

【例題2】



$$V = IZ$$

$$\dot{Z} = 12 + j5$$

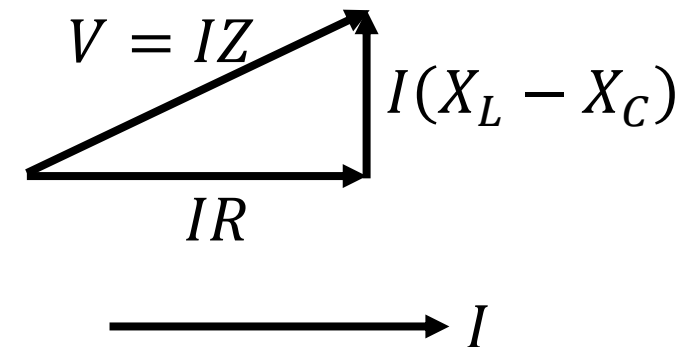
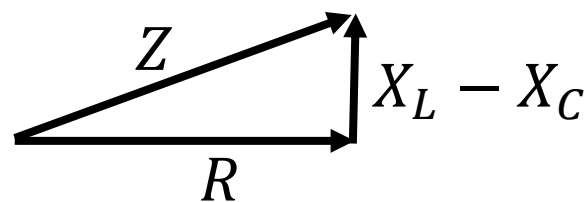
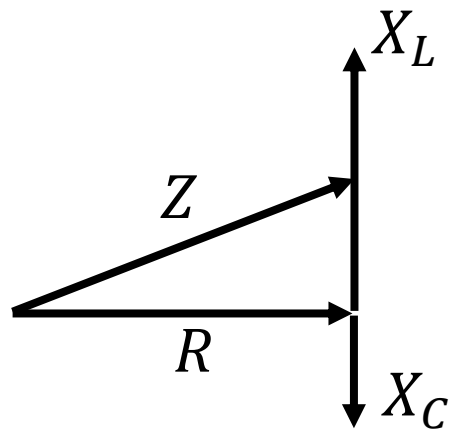
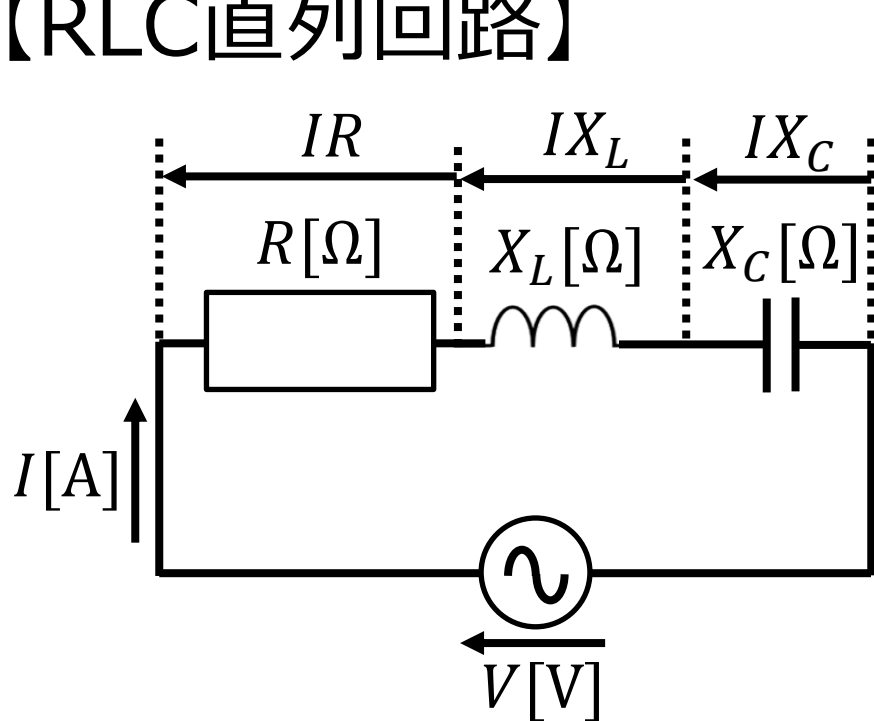
$$Z = \sqrt{12^2 + 5^2}$$

$$Z = 13$$

$$I = \frac{39}{13}$$

$$I = 3[\text{A}]$$

【RLC直列回路】

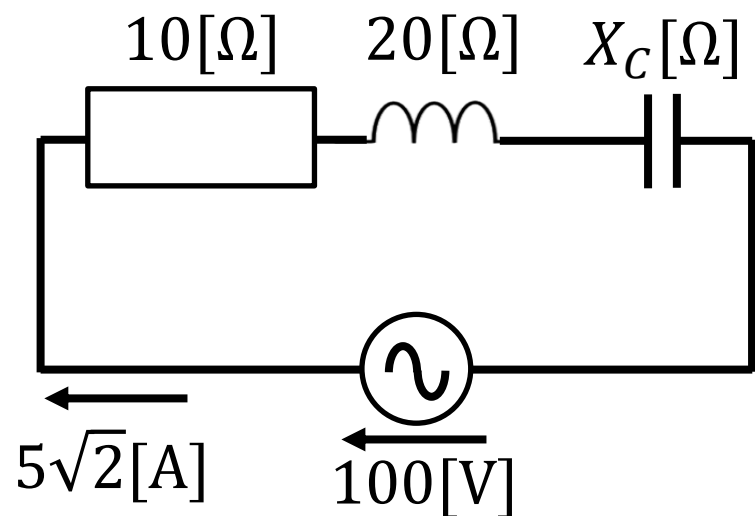


$$\dot{V} = IR + jI(X_L - X_C)$$

$$\dot{Z} = R + j(X_L - X_C)$$

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

【例題3】



$$Z = \frac{V}{I}$$

$$Z = \frac{100}{5\sqrt{2}}$$

$$Z = 10\sqrt{2}$$

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

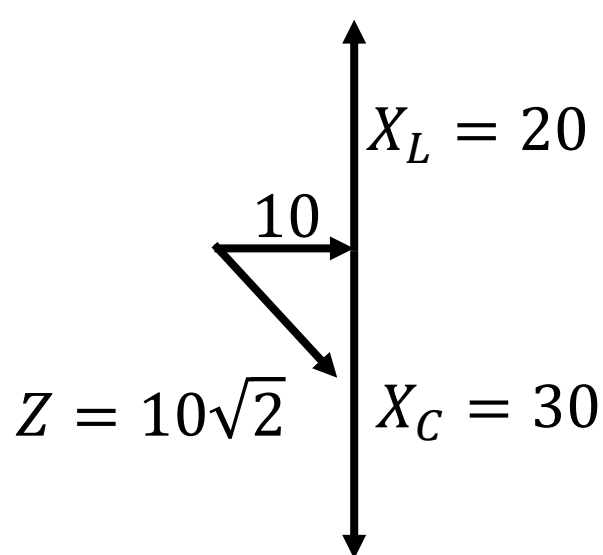
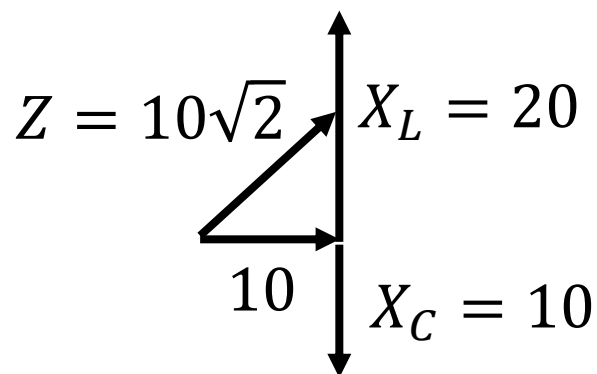
$$10\sqrt{2} = \sqrt{10^2 + X^2}$$

$$200 = 100 + X^2$$

$$X = \pm 10$$

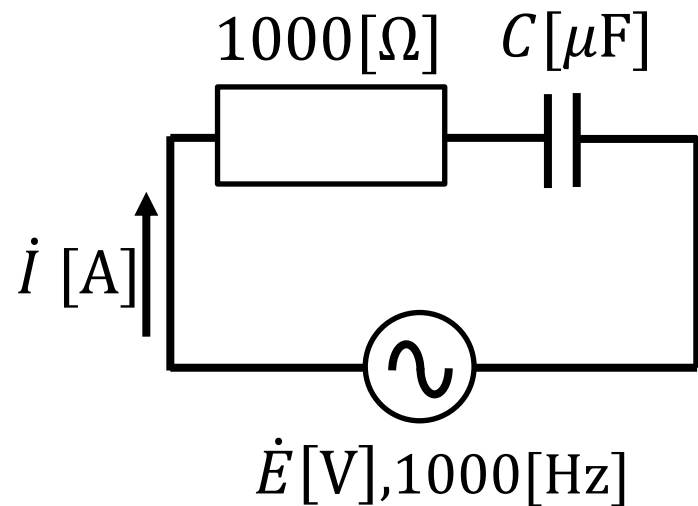
$$20 - X_C = \pm 10$$

$$X_C = 10[\Omega], 30[\Omega]$$



■ HW(H23)

図の交流回路において、電源電圧 \dot{E} [V]と電流 i [A]の位相差は $\frac{\pi}{3}$ [rad]であった。このとき、コンデンサの静電容量 C [μF]の値として、最も近いものを次の(1)～(5)のうちから一つ選べ。



(1) 0.053

(2) 0.092

(3) 0.107

(4) 0.159

(5) 0.258