

問1

$$(1) 10\angle 30^\circ = 10(\cos(30^\circ) + j\sin(30^\circ)) = 8.66 + j5$$

$$(2) 10\angle -30^\circ = 10(\cos(-30^\circ) + j\sin(-30^\circ)) = 8.66 - j5$$

問2

$$(1) -10 + j20 = \sqrt{(-10)^2 + (20)^2} \angle (\tan^{-1}(\frac{20}{-10}) + 180^\circ) = 22.36\angle 116.6^\circ$$

$$(2) -10 - j20 = \sqrt{(-10)^2 + (-20)^2} \angle (\tan^{-1}(\frac{-20}{-10}) + 180^\circ) = 22.36\angle 243.4^\circ$$

問3

$$(1) 10\angle 30^\circ \times 5\angle 20^\circ = (10 \times 5)\angle (30^\circ + 20^\circ) = 50\angle 50^\circ$$

$$(2) 10\angle 30^\circ \div 5\angle 20^\circ = (10 \div 5)\angle (30^\circ - 20^\circ) = 2\angle 10^\circ$$

問4

(1)

$$Z_C = \frac{1}{j\omega C} = \frac{1}{j2\pi f C} = \frac{1}{j \times 2 \times 3.14 \times 1 \times 10^3 \times 10 \times 10^{-6}} = -j15.92[\Omega]$$

$$Z_L = j\omega L = j2\pi f L = j \times 2 \times 3.14 \times 1 \times 10^3 \times 1 \times 10^{-3} = j6.28[\Omega]$$

$$Z = Z_C + Z_L + Z_R = -j15.92 + j6.28 + 10 = 10 - j9.64[\Omega]$$

(2)

$$f_0 = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2 \times 3.14 \sqrt{1 \times 10^{-3} \times 10 \times 10^{-6}}} = 1592[\text{Hz}]$$

(3)

$$Z_L = j\omega L = j2\pi f L = j2 \times 3.14 \times 1592 \times 1 \times 10^{-3} = j10[\Omega]$$

$$Z_C = \frac{1}{j\omega C} = \frac{1}{j2\pi f C} = \frac{1}{j2 \times 3.14 \times 1592 \times 10 \times 10^{-6}} = -j10[\Omega]$$

$$Z = Z_C + Z_L + Z_R = 10 + j10 - j10 = 10[\Omega]$$

共振時ということから、 $Z = Z_R = 10[\Omega]$ としてもよい。

$$(4) I = \frac{V}{Z} = \frac{10\angle 0^\circ}{10\angle 0^\circ} = \frac{10}{10} \angle 0^\circ - 0^\circ = 1\angle 0^\circ[\text{A}]$$

$$(5) V = IZ = 1\angle 0^\circ \times 10\angle 0^\circ = 1 \times 10 \angle 0^\circ + 0^\circ = 10\angle 0^\circ$$

$$(6) V_C = IZ_C = 1\angle 0^\circ \times 10\angle -90^\circ = 1 \times 10 \angle 0^\circ + (-90)^\circ = 10\angle -90^\circ[\text{V}]$$