ELECTRICAL ENGINEERING FUNDAMENTAL II

Name: **Test 1** 2024.3.22

Note: Make your calculation accuracy to <u>at least</u> the 2nd digit behind the decimal point.

1. (20%) Convert the following pairs of sinusoid signals v and i into ***phasors*** and complete the following information.

(A) $v(t) = 10\cos(4t - 60^\circ)$ ⇒ $\boldsymbol{V}$ = _____ ∠ _____ (polar) = _____ (rectangular)

$i(t) = 4\sin(4t + 50^\circ)$ ⇒ $\boldsymbol{I}$ = _____ ∠ _____ (polar) = _____ (rectangular)

⇒ $\boldsymbol{i(t)}$ **<u>leads</u>** $\boldsymbol{v(t)}$ by _____°

(B) $v(t) = -13\cos(2t) + 5\sin(2t)$ ⇒ $\boldsymbol{V}$ = _____ ∠ _____ (polar) = _____ (rectangular)

$i(t) = 15\cos(2t - 40^\circ)$ ⇒ $\boldsymbol{I}$ = _____ ∠ _____ (polar) = _____ (rectangular)

⇒ $\boldsymbol{v(t)}$ **<u>leads</u>** $\boldsymbol{i(t)}$ by _____°

2. (20%) Evaluate the following complex numbers and express results in both ***polar*** and ***rectangular*** forms. (show math. works)

(A) $\frac{60\angle 45^\circ}{7.5-j10} + j2 =$

(B) $\frac{(10\angle 30^\circ)(35\angle(-50^\circ))}{(2+j6)^* - (5+j)} =$

3. (15%) Solve the following integrodifferential equation to get $\boldsymbol{v}(t)$ using the phasor approach.

$$\frac{dv(t)}{dt} + 5v(t) + 4\int v(t)dt = 20\sin(4t + 10^\circ)$$

4. (20%) For the circuit in Fig. 4, calculate Z_{eq} and V_{ab}.

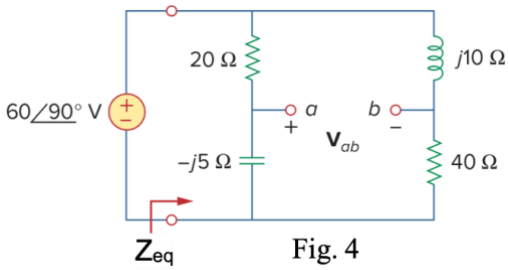
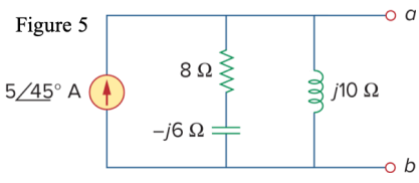


Fig. 4

5. (15%) For the circuit depicted in Fig. 5, find the Thevenin equivalent circuit at terminals a-b.



6. (20%) In the circuit of Fig. 6, determine the mesh currents $\boldsymbol{i}_1$ and $\boldsymbol{i}_2$ with mesh analysis.
Let $\boldsymbol{v}_1 = 10 \cos 4t$ (V) and $\boldsymbol{v}_2 = 20 \cos (4t - 60^\circ)$ (V).

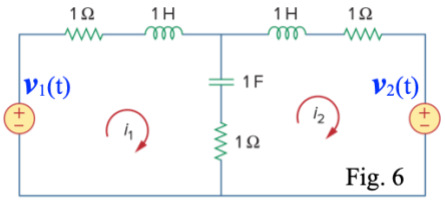


Fig. 6

7. (20%) Determine i_O in the circuit of Fig. 7.
Let $\boldsymbol{v}_1(t) = 24$ (V), $\boldsymbol{v}_2(t) = 10 \sin (t + 60^\circ)$ (V), $\boldsymbol{i}(t) = 2 \cos (2t)$ (A).

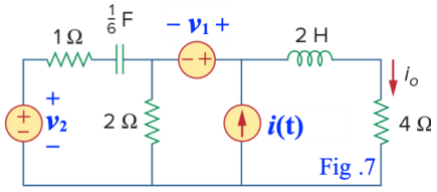


Fig .7