PDH Academy

Final Exam
Continuing Education Course #538
AC Electrical 101+
Part I: Concepts & Single Phase

1. What is the phasor voltage 120 V∠30° as a function of time? The frequency is 60 Hz unless stated otherwise. The voltage is given as the "effective value" phasor notation.

- a. $v(t) = 170\sin\left(60t + \frac{\pi}{6}\right)$
- b. $v(t) = 170\sin\left(377t + \frac{\pi}{6}\right)$
- c. $v(t) = 170\sin\left(377t + \frac{\pi}{3}\right)$
- d. $v(t) = 120\sin\left(377t + \frac{\pi}{6}\right)$

2. What is 15∠-180° in rectangular form?

- a. $0 - j15$
- b. $-1 + j0$
- c. $-15 + j0$
- d. $-15 + j15$

3. What approximately is 10∠37° in rectangular form?

- a. $8 + j6$
- b. $6 + j8$
- c. $6 + j6$
- d. $6 + j3$

4. What approximately is 50∠120° in rectangular form?

- a. $25 + j43$
- b. $-25 - j43$
- c. $-25 + j34$
- d. $-25 + j43$

5. What approximately is 21∠-π/2 in rectangular form?

- a. $0 - j21$
- b. $21 - j0$
- c. $21 - j21$
- d. $21 + j21$

6. What is $6 + j7$ in phasor form?

- a. $9.22∠40°$
- b. $9.22∠49.4°$
- c. $49.4∠9.22°$
- d. $49.4∠40°$

7. What is $50 - j60$ in phasor form?

- a. $78.10∠-40°$

b. **78.10∠40°**
c. **−78.10∠50.19°**
d. **78.10∠ − 50.19°**

8. What is **− 75 + j45** in phasor form?
a. **87.46∠149.04°**
b. **87.46∠ − 30°**
c. **149.04∠87.46°**
d. **149.04∠ − 87.46°**

9. What is **90 − j180** in phasor form?
a. **201.25∠63.43°**
b. **20.1∠ − 63.43°**
c. **20.1∠63.43°**
d. **201.25∠ − 63.43°**

10. Which of the following is Euler's Identity?
a. $\Sigma V = 0$
b. $j = \sqrt{-1} = 1\angle\frac{\pi}{2}$
c. $\cos^2\theta + \sin^2\theta = 1$
d. $e^{j\theta} = \cos\theta + j\sin\theta$

11. Express the following in phasor form:

$$\frac{(7+j5)}{6}$$

a. **1.4∠52.54°**
b. **1.4∠35.54°**
c. **8.4∠52.54°**
d. **8.4∠35.54°**

12. Express the following in phasor form:

$$\frac{(13+j17)}{(15-j10)}$$

a. **1.19∠18.90°**
b. **1.19∠86.28°**
c. **3.37∠18.90°**
d. **3.37∠86.28°**

13. Express the following in phasor form:

$$\frac{0.020\angle90°}{0.034\angle56°}$$

a. **0.59∠34°**
b. **0.59∠ − 34°**
c. **32.3∠34°**
d. **34∠1°**

14. A sinusoidal waveform has a peak at 1 ms and a period of 10 ms. What is the approximate angular frequency?
a. 0.63 rad/s
b. 6.30 rad/s
c. 200 rad/s
d. 630 rad/s

15. An 80 µF capacitor is in series with a 9 mH inductor.

What is the impedance of the capacitor?
- ○ a. $0.03\Omega\angle - 90°$
- ○ b. $0.03\Omega\angle 90°$
- ○ c. $33.16\Omega\angle - 90°$
- ○ d. $33.16\Omega\angle 90°$

16. An 80 µF capacitor is in series with a 9 mH inductor.

What is the impedance of the inductor?
- ○ a. $3.39\Omega\angle 90°$
- ○ b. $3.39\Omega\angle - 90°$
- ○ c. $540\Omega\angle 90°$
- ○ d. $3400\Omega\angle 90°$

17. An 80 µF capacitor is in series with a 9 mH inductor.

What is the impedance angle? Is the circuit leading or lagging?
- ○ a. $\angle - 90°$ leading
- ○ b. $\angle + 90°$ leading
- ○ c. $\angle - 90°$ lagging
- ○ d. $\angle + 90°$ lagging

18. What is the average value of a sinusoid? What is average value of a rectified sinusoid?
- ○ a. 0 ; $\dfrac{2V_m}{\pi}$
- ○ b. $2\pi V_{max}$; $\dfrac{2V_m}{\pi}$
- ○ c. $\dfrac{2V_m}{\pi}$; $2V_{max}$
- ○ d. $\dfrac{V_m}{\pi}$; 0

19. What is the rms value of a sawtooth waveform? What is the associated Crest Factor?
- ○ a. $\dfrac{V_m}{\sqrt{2}}$; $\dfrac{1}{\sqrt{2}}$
- ○ b. $\dfrac{V_m}{\sqrt{2}}$; $\sqrt{2}$
- ○ c. $\dfrac{V_m}{\sqrt{3}}$; $\dfrac{1}{\sqrt{3}}$
- ○ d. $\dfrac{V_m}{\sqrt{3}}$; $\sqrt{3}$

20. What is the rms value of a 12 V signal?
- ○ a. 1.2 V
- ○ b. 6 V
- ○ c. 7.6 V
- ○ d. 12 V

21. Capacitor oppose the rate of change of _____ in a circuit.
- ○ a. current
- ○ b. power
- ○ c. resistance
- ○ d. voltage

22. Inductors oppose the rate of change of _____ in a circuit.
- a. current
- b. power
- c. resistance
- d. voltage

23. In a leading circuit, the impedance angle is _____ and the current leads by _____ degrees.
- a. negative ; 90°
- b. negative; -180°
- c. positive; -90°
- d. positive; +180°

24. In a lagging circuit, the impedance angle is _____ and the current leads by _____ degrees.
- a. negative ; 90°
- b. negative; -180°
- c. positive; +90°
- d. positive; -180°

25. Four inductors are in series with values of 3 mH, 4 mH, 5 mH, and 6 mH.

What is the total inductance of the circuit?
- a. 0.95 mH
- b. 7 mH
- c. 11 mH
- d. 18 mH

26. Two capacitors are in series with values of 3 µF and 4 µF.

What is the total capacitance of the circuit?
- a. 1.7 µF
- b. 3.7 µF
- c. 4.7 µF
- d. 12 µF

27. The power factor is the relationship between current and voltage. However, it is equivalent to describing the power factor as the _____ power divided by the _____ power.
- a. real / reactive
- b. reactive / real
- c. apparent / real
- d. real / apparent