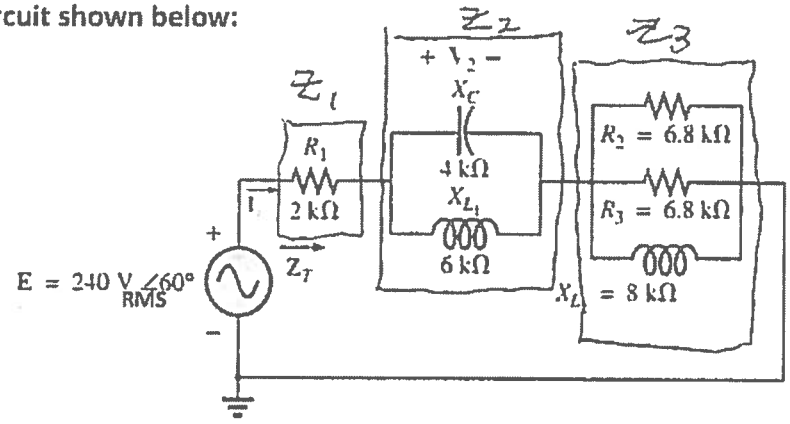
NAME (printed): SOLUTIONS Program: _____

This is a TIMED quiz – You have 15 minutes to complete. All 6 multiple-choice questions are equally weighted, there is no partial credit available – circle the most appropriate answer. Use your calculator and knowledge of AC circuits to answer the following questions about the circuit shown below:



$Z_1 = 2K\Omega$

$Z_{3\parallel} = \frac{(3.4K)(j8K)}{3.4K + j8K}$

$Z_{3\parallel} = (2.88K + j1.22K)\Omega$

$\frac{1}{Z_{2\parallel}} = \frac{1}{-j4K} + \frac{1}{j6K}$

$Z_{2\parallel} = -j12K\Omega$

1. Calculate Z_T in rectangular form:

C
A) (5.4K + j10.0K) Ω
B) (4.9K - j13.9K) Ω
(C) (4.9K - j10.8K) Ω
D) (5.4K - j10.8K) Ω

$Z_T = Z_1 + Z_2 + Z_3$

$Z_T = 4.9K\Omega - j10.8K\Omega$

2. Determine Z_T in polar form (angle in degrees):

D
A) 12.1K Ω < 63°
B) 11.4K Ω < 62°
C) 14.7K Ω < 71°
(D) 11.8K Ω < -66°

$Z_T = 11.8K\Omega \angle -66^\circ$

3. Find Is in polar form (angle in radians):

A
(A) 20.3 mArms < 2.2 rad
B) 16.3 mArms < 0.02 rad
C) 19.8 mArms < 0.02 rad
D) 21.1 mArms < 2.2 rad

$I_S = \frac{240 V_{RMS} \angle 60^\circ}{11.8K\Omega \angle -66} = 20.3 mA_{RMS} \angle +126^\circ$

$126^\circ = 2.2 (Rad)$

$I_S = 20.3 mA_{RMS} \angle 2.2 (Rad)$

4. Calculate V2 in polar form (angle in degrees):

D
A) 238 Vrms < +36°
B) 238 Vrms < -36°
C) 33 Vrms < -36°
(D) 244 Vrms < 36°

$\bar{V}_2 = \bar{I}_S Z_2 = (20.3mA \angle 126^\circ)(12K \angle -90^\circ)$

$V_2 = 244 V_{RMS} \angle +36^\circ$

Problems 5 and 6 on the back →

5. Find the average power delivered to the network from the source:

A) 4.9 W
B) 3.5 W
C) 2.9 W
(D) 2.0 W

D

$P_A = V_{RMS} \cdot I_{RMS} \cdot \cos(\theta_V - \theta_I)$

$240 \cdot 20.3m \cdot 0.41$

$\boxed{P_A = 2.0W}$

CHECK

$P_A = I_{RMS}^2 R$

$= (20.3m)^2 \cdot 4.9K$

$= 2.0W$ ☺

6. Find the power factor of the network:

(A) 0.41 leading
B) 0.1 lagging
C) -0.1 leading
D) 0.40 lagging

A

CIRCUIT IS MOSTLY CAPACITIVE (ICE)

USING CURRENT AS A REFERENCE,

CURRENT LEADS VOLTAGE.