

**University of Jordan
School of Engineering
Electrical Engineering Department**

**EE 204
Electrical Engineering Lab**

**EXPERIMENT 6 REPORT & PRE-LAB
INDUCTIVE REACTANCE**

Section # _____ Group # _____

Student Name

ID

- 1.**
- 2.**
- 3.**
- 4.**

EXPERIMENT 6 INDUCTIVE REACTANCE

Note: Use MATLAB to quickly perform theoretical calculations by defining a vector of frequencies then using array arithmetic.

PROCEDURE A - AC-EXCITED SERIES RL CIRCUIT

6. Which of the above two methods did you decide to use to measure V_R ?

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7. Can we just subtract the magnitudes of $|V_S| - |V_L|$ to obtain the magnitude $|V_R|$? Why or why not?

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9. What is the relationship between the periods T of the two signals V_S and V_R ?

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Table 1

AC Source Frequency (Hz)	V_S (peak) (V)		V_S period T (ms)		V_L (peak) (V)		$\angle V_L$ with V_S (Lead = positive)	
	Theory	Meas.	Theory	Meas.	Theory	Meas.	Theory	Meas.
700	3							
1300	3							
2600	3							
5200	3							
9100	3							
14400	3							
22200	3							
39200	3							

Table 2

AC Source Frequency (Hz)	V_R (peak) (V)		$\angle V_R$ with V_S (Lag = negative)		V_R period T (ms)		I and $\angle I$ (mA) = V_R/R	
	Theory	Meas.	Theory	Meas.	Theory	Meas.	Theory	Meas.
700								
1300								
2600								
5200								
9100								
14400								
22200								
39200								

Table 3

AC Source Frequency (Hz)	$X_L = V_L / I $ (peak/peak) (k Ω)		$ Z = V_S / I $ (peak/peak) (k Ω)		$\angle Z = \angle V_S - \angle I$ (degrees)	
	Theory	Meas.	Theory	Meas.	Theory	Meas.
700						
1300						
2600						
5200						
9100						
14400						
22200						
39200						

12. Using the *measured* values in Table 3, plot (**by hand**) the following figures using the graph paper attached at the end of the report: (1) X_L and $|Z|$ on the same plot versus source frequency; (2) $\angle Z$ versus source frequency; (3) V_L and V_R on the same plot versus source frequency.

13. For the above plots, state your conclusions under the plot?

15. Using the values in Table 4, plot (**by hand**) the following figure using the graph paper attached at the end of the report: P and Q on the same plot versus source frequency.

16. For the above plot, state your conclusions under the plot?

17. At what frequency the real power P is maximum? Why?

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18. At what frequency the magnitude of the reactive power $|Q|$ is maximum? Why?

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Table 4

AC Source Frequency (Hz)	$ S $ (mVA)	$\angle S$ (degrees)	P (mW)	Q (mVAR)	PF value	PF lead or lag
	Measured	Measured	Measured	Measured	Measured	Measured
700						
1300						
2600						
5200						
9100						
14400						
22200						
39200						

PROCEDURE B - AC-EXCITED PARALLEL RL CIRCUIT

Table 5

AC Source Frequency (Hz)	$V_{R'}$ (peak) (V)		$\angle V_{R'}$ with V_s (Lag = negative)		$V_R = V_L \approx V_s$ (peak) (V)		$\angle V_R$ with V_s (degrees)	
	Theory	Meas.	Theory	Meas.	Theory	Meas.	Theory	Meas.
810					3		0°	0°
1620					3		0°	0°
4100					3		0°	0°
5700					3		0°	0°
8100					3		0°	0°
11400					3		0°	0°
17900					3		0°	0°
30000					3		0°	0°

Table 6

AC Source Frequency (Hz)	I (peak) (mA) = $V_{R'}/R'$		$\angle I$ with V_s (Lag = negative)		I_R (peak) (mA) = V_R/R		$\angle I_R$ with V_s (degrees)	
	Theory	Meas.	Theory	Meas.	Theory	Meas.	Theory	Meas.
810							0°	0°
1620							0°	0°
4100							0°	0°
5700							0°	0°
8100							0°	0°
11400							0°	0°
17900							0°	0°
30000							0°	0°

Table 7

AC Source Frequency (Hz)	$I_L = I - I_R$ (mA) (magnitude (peak) and phase (degrees)) (phasor subtraction)	
	Theory	Measured
810		
1620		
4100		
5700		
8100		
11400		
17900		
30000		

8. Can we just subtract the magnitudes of $|I| - |I_R|$ to obtain the magnitude $|I_L|$? Why or why not?

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Table 8

AC Source Frequency (Hz)	$B_L = I_L / V_L $ (peak/peak) (mS)		$ Y = I / V_S $ (peak/peak) (mS)		$\angle Y = \angle I - \angle V_S$ (degrees)	
	Theory	Meas.	Theory	Meas.	Theory	Meas.
810						
1620						
4100						
5700						
8100						
11400						
17900						
30000						

10. Using the *measured* values in Table 8, plot (**by hand**) the following figures using the graph paper attached at the end of the report: (1) B_L and $|Y|$ on the same plot versus source frequency; (2) $\angle Y$ versus source frequency; (3) I_L and I_R on the same plot versus source frequency.

11. For the above plots, state your conclusions under the plot?

Table 9

AC Source Frequency (Hz)	$ S $ (mVA)	$\angle S$ (degrees)	P (mW)	Q (mVAR)	PF value	PF lead or lag
	Measured	Measured	Measured	Measured	Measured	Measured
810						
1620						
4100						
5700						
8100						
11400						
17900						
30000						

13. Using the values in Table 9, plot (**by hand**) the following figure using the graph paper attached at the end of the report: P and Q on the same plot versus source frequency.

14. For the above plot, state your conclusions under the plot?

15. At what frequency the real power P is maximum? Why?

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16. At what frequency the magnitude of the reactive power $|Q|$ is maximum? Why?

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CONCLUSIONS

Summarize in clear but concise format what you learned from this experiment:

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**** End ****









