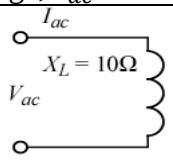
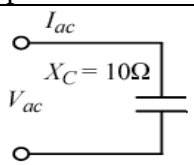
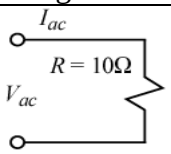
ELEC 342: Quiz 1 Solution **January 30, 2026**

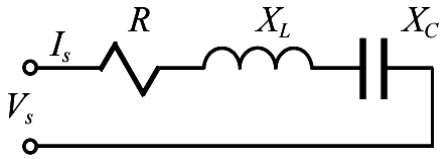
Name:_____ _____ Student ID:_____

Close notes and books. Quizzes suspected of cheating and/or turned in late will not be marked. You have 15 minutes to answer the following questions:

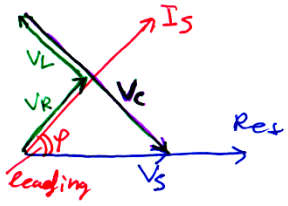
Q1 (30pts): Assume an ideal inductor, capacitor, and resistor, each with an impedance of $X = 10\ \Omega$. Each element is supplied with AC voltage, $V_{ac} = 90\ V$ (rms). Complete the Table below, including the **units**:

Calculate the following quantities for ideal inductor, capacitor, and resistor	**Units**			
Current	A	9	9	9
Real Power	W	0	0	810
Apparent Power	VA	810	810	810
Reactive Power	VAR	810	810	0
Power Factor		0	0	1
Power Factor Angle (circle one which applies)	deg. or rad.	Value:_+90___ leading, in-phase, **lagging**	Value: __-90___ **leading**, in-phase, lagging	Value: __0___ leading, **in-phase**, lagging

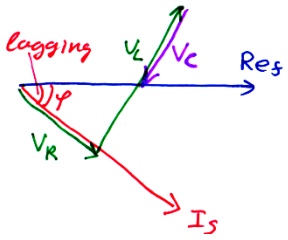
Q2 (20pts): Sketch a phasor diagram and show the voltage drops on *R L C* elements and the current I_s



a) (10pts) assuming $R = X_L = 1\Omega;\ \ X_C = 2\Omega$



b) (10pts) assuming $R = X_C = 1\Omega;\ \ X_L = 2\Omega$

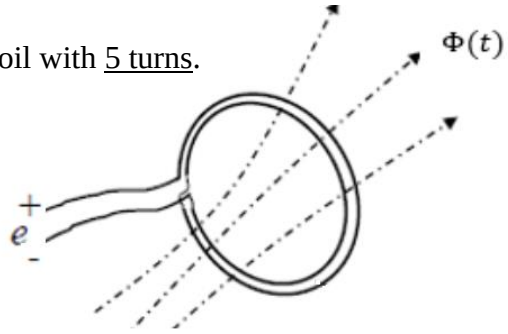


Q3 (30pts): A time-varying flux $\Phi(t) = (3.14 + 5*t)$ Wb flows through a coil with 5 turns.

a) Calculate the flux linkage $\lambda(t)$:

b) Calculate the EMF voltage $e(t)$ induced at the terminals of the coil:

c) What can you do if you need to double this voltage?

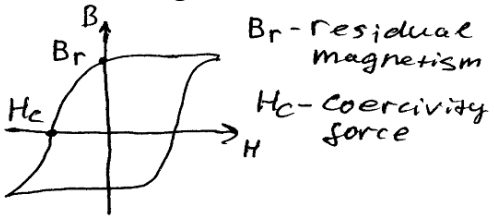


Lamda(t) = 5*(3.14 + 5*t)

E(t) = 5*5 = 25V.

To double this voltage, you can either makes the flux change faster, say at 10*t; or you can increase the number of turns from 5 to 10. You can also use a combination of these two measures.

Q4 (20pts): Sketch a hysteresis loop and show the residual magnetization and coercivity force. In a few words, define their meaning.



Br – amount of magnetization (flux density) remaining after the external field has been removed.

Hc – external field intensity required to bring down the residual magnetization