**Inductive Reactance Written Exam Answer Key**

1. State three formulas for determining true power.
   1. PT = I2R
   2. PT = VRIR
   3. PT = EI cos *θ* or VI (PF) where PF is the power factor
2. State three formulas for determining apparent power.
   1. PA = VI
   2. PA = I2Z
   3. PA = V2 / Z
3. State three formulas for determining reactive power.
   1. PX = I2X
   2. PX = VXIX
   3. PX = VI sin *θ* where sin *θ* = VR / VA or R **/ X**
4. State four formulas for determining power factor.
   1. PF = PT / PA
   2. PF = VR / VS
   3. PF = R/Z
   4. PF = cos θ where θ is angle between current and voltage
5. State the formula for determining quality factor (Q) or figure of merit of an inductor.

Q = XL / RS where XL is inductive reactance in ohms and RS is series resistance in ohms

1. Compute the applied voltage and impedance in a series RL circuit in which the voltage across the resistor is 50 volts, the voltage across the inductor is 120 volts, and the current is 13 milliamps.

a. Applied voltage is \_\_130\_\_ volts

EA = **√**(VR)2 + (VL)2 = **√** (50)2 + (120)2 =130 Volts

b. Impedance is \_\_\_10000\_\_\_ohms.

A **= VA/I** = **130 V /** 0.013A = **10000Ω**

7. From the figure above, find:

a. XL = 2π f L = 6.28 x 8000 x 0.1h = 5027 Ω

b. Z = √ ( R)2 + (XL)2 = √ (20000Ω)2 + (5027Ω)2 = 20622 Ω

c. I =⁄ VA/Z = 40V⁄20622Ω = 1.94 maΩ

1. VR = IR = (0.00194) (20000) = 38.8 volts

e. VL = IX XL = (0.00194a) (5027Ω) = 9.75 volts

8. From the figure above, find:

* 1. XL =2ππf L = 6.28 x 60 Hz x 0.002 = 75.4 Ω
  2. Z = √( R)2 + (XL)2 = √ (200)2 + (75.4)2 = 213.74 Ω
  3. I = VA / Z = 120v / 213.74 Ω = 0.561 amperes
  4. VR = IR = (0.561) x (200) = 112.28 volts
  5. VL = I XL= (0.561) (75.4) = 42.3 volts

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| 9. From the figure above, find |
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a. XLT = 2π f L = 6.28 x 200 Hz x .03 h = 37.7 Ω



b. Z = √ R2+ X**L** 2 ) = √302 + 37.72 = 48.18 Ω

1. I = VA / XL = 50v / 48.18 Ω = 1.04 amps
2. VL = I XL = (1.04) (37.7 Ω) = 39.1 volts

e. θ = Tan-1 = Tan-1 = 51.5°

1. From the figure above, find

a. XL1 = 2π f L = 6.28 x 25000 Hz x .0075 h = 1178 Ω



b. √(R2 +XL2 )= √10002 +11782 = 1545.3 Ω

1. I = VS / Z = 150v / 1545.3 Ω = 0.097 amps or 97 ma
2. VL = IXL = (0.097 a) (1178 Ω) = 114.3 volts

e. θ = Tan-1 = Tan-1 = 49.7°