

# Extra Class Math

## Session 2



# Today's Plan

- Introduce the Extra Class Reference sheet
- Radio units review
- Driving the TI-36X Pro
- Work an exam math problem



# Extra Class Reference Sheet

- Chapter 4 focus: Electrical Principles
- One page
- Unit value review
- Formulas needed for the exam
- Memory aids



# Reference Sheet

## Extra Class Reference Sheet

### Radio Units

Prefix	Symbol	Power X 10 <sup>n</sup>	Value Examples
giga	G	9	Hertz, Watts
mega	M	6	Hertz, Ohms, Watts
kilo	K	3	Hertz, Ohms, Watts, Volts
(unit)		0	
milli	m	-3	Volts, Amps, Watts, Henrys
micro	μ	-6	Volts, Amps, Henrys, Farads
nano	n	-9	Farads
pico	p	-12	Farads

### Time Constants

$$T_C = RC \qquad 1T_C = 63.2\% \text{ charging; } 36.8\% \text{ discharging}$$

### Reactance

$$X_C = \frac{1}{2\pi fC} \text{ "Negative"} \qquad X_L = 2\pi fL \text{ "Positive"}$$

### Power Factor

$$P_{REAL (Watts)} = P_{APPARENT (VA)} * PF \qquad PF = \cos \theta$$

### Resonant Frequency

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

### Quality Factor or Q

$$\text{For resonant circuit: } Q_{SERIES} = \frac{X}{R} \qquad Q_{PARALLEL} = \frac{R}{X}$$

### Q and Resonant Circuit Half-Power Bandwidth

$$\text{Half-power bandwidth} = \frac{f_r}{Q}$$

### Toroid Winding Value – number of turns

$$\text{Powdered Iron: } N = 100 \sqrt{\frac{L(\mu H)}{A_L(\mu H/100 \text{ turns})}} \qquad \text{Ferrite Core: } N = 1000 \sqrt{\frac{L(mH)}{A_L(mH/1000 \text{ turns})}}$$

### Aids

#### Direct and Inverse Relationships

*E, I the I, E man*

$$\text{Impedance (Z)} = \frac{1}{\text{Admittance (Y)}}$$

$$\text{Reactance (X)} = \frac{1}{\text{Susceptance (B)}} \quad X \text{ to B phase angle reversal}$$



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# Direct and Inverse

- Direct relationship

$$X_L = 2\pi fL$$

- Inductive reactance **increases** with an increase in frequency
- As the value of inductance **increases**, the inductive reactance also increases

- Inverse relationship

$$X_C = \frac{1}{2\pi fC}$$

- Capacitive reactance **decreases** with an increase in frequency
- As the value of capacitance **decreases**, the capacitive reactance increases



# TI-36X Pro

- Shift (2<sup>nd</sup>)
- On/Off and Reset
- Most used
  - Clear
  - Enter
  - Navigation
- Error Correction: Insert/Delete
- Least obvious: Answer toggle
- Multi-tap keys – pi example
- Mode key
  - Check current state
  - Navigation and set (Enter)
  - 3 items to set for our class
  - How to exit (Clear)
- Answer function
- Fraction key
- Negation key
- Square and square root
- EE (Exponent entry)
- Cos (Cosine)





# Work a Problem

## Resonant Frequency

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

$$L = 50 \mu\text{H}$$

$$C = 40\text{pf}$$

3.56 MHz?



Wow – we covered a lot!

Now go home and practice!

