ETA Common Formulas

Conversion Factors:
\[ \pi (\text{Pi}) = 3.14 \]
\[ 2\pi = 6.28 \]
\[ \pi^2 = 9.87 \]
\[ \log\pi = 0.497 \]
1 meter = 3.28 feet
1 inch = 2.54 centimeters
1 radian = 57.3°

Resonant frequency formulas
Where \( f \) is in kHz, \( L \) is in microhenries, \( C \) is in microfarads
\[ f_{\text{Hz}} = 159.2 \frac{1}{\sqrt{LC}} \]
\[ f_{\text{ResoHz}} = \frac{1}{2\pi \sqrt{LC}} \]

Frequency & Wavelength formulas
\[ f = \text{frequency}, \quad \lambda = \text{wavelength} \]
0.5\( \lambda \) = 180° = half wave  
0.25\( \lambda \) = 90° = quarter wave
\[ f_{\text{Hz}} = (3 \times 10^8) + \lambda \text{meters} \quad \text{or} \quad f_{\text{MHz}} = 984 + \lambda \text{feet} \]
\[ \lambda \text{meters} = (3 \times 10^8) + f_{\text{Hz}} \quad \text{or} \quad \lambda \text{feet} = 984 + f_{\text{MHz}} \]

Sine wave conversion
(RMS = root mean square).
Effective value (RMS) = 0.707 × Peak Value = 1.11 × Average Value
Peak Value = 1.414 × Effective Value (RMS) = 1.57 × Average Value
Average Value = 0.637 × Peak Value = 0.9 × Effective Value (RMS)
Identify: Waveform, Peak (amplitude), RMS, 1 cycle over time period (frequency), Peak to peak, and practical average.

Ohm’s Law

\[ P = I \times E \]
\[ R = \frac{E}{I} \]
\[ Z = \sqrt{R^2 + \left(\frac{E}{I}\right)^2} \]

Time constants
\( T \) (Greek Tau), \( R \) (ohms), \( C \) (microfarads), \( L \) (microhenries)
\[ \text{RL circuit: } T = L \times R \]
\[ \text{RC circuit: } T = C \times R \]

Gain dB = 10 log \((P_1 / P_2)\)
Gain dB = 20 log \((V_{out} / V_{in})\)

Voltage gain in decibels
\[ V_{out} = E - V_{\text{terminal}} \]
\[ W = \frac{1}{2} C \times V^2 \]

Energy Storage in a Capacitor
where \( W \) is the energy (in Joules), \( C \) is the capacitance (in farads), and \( V \) is the potential difference (in volts).

How to Compute Charge or Quantity of Electricity
where \( Q \) is the charge (in coulombs), \( C \) is the capacitance (in farads), and \( V \) is the potential difference (in volts).
\[ Q = C \times V \]

Capacitors connected in parallel
\[ C = C_1 + C_2 + C_3 + \ldots \]

Capacitors connected in series
\[ 1 + C = (1 + C_1) + (1 + C_2) + (1 + C_3) + \ldots \]

Reactance of capacitors
\[ X_C = 1 + (2 \times \pi \times f \times C) \]

Impedance Formulas for a Series Circuit
\[ Z = \sqrt{R^2 + (X_L - X_C)^2} \]

Impedance Formulas for \( R \) and \( X \) in Parallel
\[ Z = \sqrt{R^2 + X^2} \]

Battery internal resistance
\[ V_{out} = E - V_{\text{terminal}} \]