Important Equations

$$\omega = 2\pi f$$

$$f = \frac{1}{T}$$

$$2\pi\ radians = 360^o$$

$$\cos(\omega t) = \sin(\omega t + \pi/2)$$

$$X_{RMS} = \sqrt{\frac{1}{T}\int_{t_o}^{t_o+T} X^2(t)dt}$$

$$X(t) = X_M cos(\omega t + \theta) \qquad X_{RMS} = \frac{X_M}{\sqrt{2}}$$

$$V = IR \qquad G = \frac{1}{R} \qquad P = VI = \frac{V^2}{R} = I^2 R \qquad P = \frac{dW(t)}{dt} \qquad i = \frac{dq(t)}{dt}$$

$$P_{AV} = V_{RMS} * I_{RMS} * \cos(\theta_V - \theta_I)$$

KCL & KVL

$$R_S = R_1 + R_2 + \cdots R_N$$

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots \frac{1}{R_N}$$

$$i_{R1} = \frac{R_2}{R_1 + R_2} i_s$$

$$v_{R1} = \frac{R_1}{R_1 + R_2} v_s$$

$$L = B - (N - 1)$$

$$i_C = C\frac{dv_C(t)}{dt} \qquad v_L = L\frac{di_L(t)}{dt}$$

$$w_C(t) = \frac{1}{2}C[v_C(t)]^2 \qquad w_L(t) = \frac{1}{2}L[i_L(t)]^2$$

$$L_S = L_1 + L_2 + \cdots L_N$$

$$\frac{1}{L_P} = \frac{1}{L_1} + \frac{1}{L_2} + \cdots \frac{1}{L_N}$$

$$C_P = C_1 + C_2 + \cdots C_N$$

$$\frac{1}{C_S} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots \frac{1}{C}$$

$$x + jy = re^{j\theta} \quad r = \sqrt{x^2 + y^2} \quad \theta = tan^{-1}\frac{y}{x} \quad x = rcos(\theta) \quad y = rsin(\theta) \quad \frac{1}{j} = -j \quad j = 1\angle 90$$

$$u(t) = U_M \cos(\omega t + \theta) = U_M \angle \theta = \boldsymbol{U}$$

$$(V_1\angle\theta_1)(V_2\angle\theta_2) = V_1V_2\angle(\theta_1 + \theta_2) \qquad \frac{(V_1\angle\theta_1)}{(V_2\angle\theta_2)} = \frac{V_1}{V_2}\angle(\theta_1 - \theta_2)$$

$$Z_R = R \qquad Z_C = \frac{1}{j\omega C} \qquad Z_L = j\omega L \qquad Y = \frac{1}{Z}$$

$$V_{dB} = 20log_{10}V_{lin}$$

$$\log(AB) = logA + logB \qquad \log\left(\frac{A}{B}\right) = logA - logB$$

$$H(j\omega) = K_O \frac{(j\omega)^{\pm N}\left(1 + j\omega\tau_{Z_1}\right)\left(1 + j\omega\tau_{Z_2}\right) \ldots \left(1 + j\omega\tau_{Z_N}\right)}{\left(1 + j\omega\tau_{P_1}\right)\left(1 + j\omega\tau_{P_2}\right) \ldots \left(1 + j\omega\tau_{P_N}\right)}$$

$$\omega_O = \frac{1}{\sqrt{LC}}$$

$$BW = \frac{\omega_O}{Q}$$

$$\tau\frac{dy}{dt} + y = K_1 \qquad y(t) = K_1 + K_2 e^{\frac{-t}{\tau}} \qquad y(0+) = K_1 + K_2$$