

Main formulae for Part 1 Basic electrical and electronic principles

General

Charge $Q = It$ Force $F = ma$

Work $W = Fs$ Power $P = \frac{W}{t}$

Energy $W = Pt$

Ohm's law $V = IR$ or $I = \frac{V}{R}$ or $R = \frac{V}{I}$

Conductance $G = \frac{1}{R}$

Power $P = VI = I^2R = \frac{V^2}{R}$ Resistance $R = \frac{\rho l}{a}$

Resistance at $\theta^\circ\text{C}$, $R_\theta = R_0(1 + \alpha_0\theta)$

Terminal p.d. of source, $V = E - Ir$

Series circuit $R = R_1 + R_2 + R_3 + \dots$

Parallel network $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$

Capacitors and capacitance

$E = \frac{V}{d}$ $C = \frac{Q}{V}$ $Q = It$ $D = \frac{Q}{A}$

$\frac{D}{E} = \epsilon_0\epsilon_r$

$C = \frac{\epsilon_0\epsilon_r A(n-1)}{d}$

Capacitors in parallel $C = C_1 + C_2 + C_3 + \dots$

Capacitors in series $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$

$W = \frac{1}{2}CV^2$

Magnetic circuits

$B = \frac{\Phi}{A}$ $F_m = NI$ $H = \frac{NI}{l}$ $\frac{B}{H} = \mu_0\mu_r$

$S = \frac{\text{mmf}}{\Phi} = \frac{l}{\mu_0\mu_r A}$

Electromagnetism

$F = BIl \sin \theta$ $F = QvB$

Electromagnetic induction

$E = Blv \sin \theta$ $E = -N \frac{d\Phi}{dt} = -L \frac{dI}{dt}$

$W = \frac{1}{2}LI^2$

$L = \frac{N\Phi}{I} = \frac{N^2}{S}$ $E_2 = -M \frac{dI_1}{dt}$ $M = \frac{N_1N_2}{S}$

Measurements

Shunt $R_s = \frac{I_a r_a}{I_s}$ Multiplier $R_M = \frac{V - I_a r_a}{I}$

Power in decibels $= 10 \log \frac{P_2}{P_1} = 20 \log \frac{I_2}{I_1} = 20 \log \frac{V_2}{V_1}$

Wheatstone bridge $R_x = \frac{R_2 R_3}{R_1}$

Potentiometer $E_2 = E_1 \left(\frac{l_2}{l_1} \right)$