BEE (Formulas)

Chapter 2

FORMULAS

2–1	$Q = \dfrac{\text{number of electrons}}{6.25 \times 10^{18}\ \text{electrons/C}}$	Charge
2–2	$V = \dfrac{W}{Q}$	Voltage equals energy divided by charge.
2–3	$I = \dfrac{Q}{t}$	Current equals charge divided by time.
2–4	$G = \dfrac{1}{R}$	Conductance is the reciprocal of resistance.
2–5	$A = d^2$	Cross-sectional area equals the diameter squared.
2–6	$R = \dfrac{\rho l}{A}$	Resistance is resistivity times length divided by cross-sectional area.

Ch 3

FORMULAS

3–1	$I = \dfrac{V}{R}$	Form of Ohm's law for calculating current
3–2	$V = IR$	Form of Ohm's law for calculating voltage
3–3	$R = \dfrac{V}{I}$	Form of Ohm's law for calculating resistance

Ch 4

FORMULAS

4–1	$P = \dfrac{W}{t}$	Power equals energy divided by time.
4–2	$P = I^2R$	Power equals current squared times resistance.
4–3	$P = VI$	Power equals voltage times current.
4–4	$P = \dfrac{V^2}{R}$	Power equals voltage squared divided by resistance.
4–5	$\text{Efficiency} = \dfrac{P_{OUT}}{P_{IN}}$	Power supply efficiency
4–6	$P_{OUT} = P_{IN} - P_{LOSS}$	Output power is input power less power loss.

Ch 5

FORMULAS

5–1	$R_T = R_1 + R_2 + R_3 + \cdots + R_n$	Total resistance of n resistors in series
5–2	$R_T = nR$	Total resistance of n equal-value resistors in series
5–3	$V_S = V_1 + V_2 + V_3 + \cdots + V_n$	Kirchhoff's voltage law
5–4	$V_S - V_1 - V_2 - V_3 - \cdots - V_n = 0$	Kirchhoff's voltage law stated another way
5–5	$V_x = \left(\frac{R_x}{R_T}\right)V_S$	Voltage-divider formula
5–6	$P_T = P_1 + P_2 + P_3 + \cdots + P_n$	Total power

Ch 6

FORMULAS

6–1	$I_{IN(1)} + I_{IN(2)} + \cdots + I_{IN(n)} = I_{OUT(1)} + I_{OUT(2)} + \cdots + I_{OUT(m)}$	Kirchhoff's current law
6–2	$R_T = \dfrac{1}{\left(\frac{1}{R_1}\right) + \left(\frac{1}{R_2}\right) + \left(\frac{1}{R_3}\right) + \cdots + \left(\frac{1}{R_n}\right)}$	Total parallel resistance
6–3	$R_T = \dfrac{R_1R_2}{R_1 + R_2}$	Special case for two resistors in parallel
6–4	$R_T = \dfrac{R}{n}$	Special case for n equal-value resistors in parallel
6–5	$R_x = \dfrac{R_AR_T}{R_A - R_T}$	Unknown parallel resistor
6–6	$I_x = \left(\frac{R_T}{R_x}\right)I_T$	General current-divider formula
6–7	$I_1 = \left(\frac{R_2}{R_1 + R_2}\right)I_T$	Two-branch current-divider formula
6–8	$I_2 = \left(\frac{R_1}{R_1 + R_2}\right)I_T$	Two-branch current-divider formula
6–9	$P_T = P_1 + P_2 + P_3 + \cdots + P_n$	Total power
6–10	$R_{open} = \dfrac{1}{G_{T(calc)} - G_{T(meas)}}$	Open branch resistance

Ch 7

FORMULAS

7–1	$I_{BLEEDER} = I_T - I_{RL1} - I_{RL2}$	Bleeder current
7–2	$R_X = R_V\left(\frac{R_2}{R_4}\right)$	Unknown resistance in a Wheatstone bridge
7–3	$\Delta V_{OUT} = \Delta R_{therm}\left(\frac{V_S}{4R}\right)$	Thermistor bridge output

Ch 8

FORMULAS

Δ-to-Y Conversions

8–1 $$R_1 = \frac{R_A R_C}{R_A + R_B + R_C}$$

8–2 $$R_2 = \frac{R_B R_C}{R_A + R_B + R_C}$$

8–3 $$R_3 = \frac{R_A R_B}{R_A + R_B + R_C}$$

Y-to-Δ Conversions

8–4 $$R_A = \frac{R_1R_2 + R_1R_3 + R_2R_3}{R_2}$$

8–5 $$R_B = \frac{R_1R_2 + R_1R_3 + R_2R_3}{R_1}$$

8–6 $$R_C = \frac{R_1R_2 + R_1R_3 + R_2R_3}{R_3}$$