Formula

1. Kirchhoff's voltage law: $\sum_{n=1}^{N} v_n = 0$ at any closed loop.
2. Kirchhoff's law: $\sum_{n=1}^{N} i_n = 0$ at any node.
3. Generalized Ohm's law: $V=IZ$, R: $Z=R$; C: $Z = \frac{1}{j\omega C}$; L: $Z = j\omega L$
4. Parallel circuit: $\frac{1}{Z_{eq}} = \sum_{i=1}^{N} \frac{1}{Z_i}$; series circuit $Z_{eq} = \sum_{i=1}^{N} Z_i$
5. Capacitor charging by *emf* through resistance: $V_c = \varepsilon\left(1 - e^{-\frac{t}{RC}}\right)$
6. Capacitor discharging through resistance: $V_c = \varepsilon e^{-\frac{t}{RC}}$
7. Inductor charging by *emf* through resistance: $i_L = \frac{\varepsilon}{R}\left(1 - e^{-\frac{t}{L/R}}\right)$
8. Inductor discharging by through resistance: $i_L = \frac{\varepsilon}{R} e^{-\frac{t}{L/R}}$
9. $i_C = C\frac{dv_C}{dt}, \quad v_L = L\frac{di_L}{dt}$
10. Transfer function $H(j\omega)=V_{out}(j\omega)/V_{in}(j\omega)$
11. 3dB point is defined when $|H(j\omega)|=1/\sqrt{2}$
12. RLC resonant circuit: $Q = \frac{\omega_0}{\Delta\omega} = \frac{\omega_0 L}{R}; \omega_0 = \frac{1}{\sqrt{LC}}$
13. Complex power: $S = \tilde{V}\tilde{I}^* = P_{av} + jQ$

$$P_{av} = I_{rms} V_{rms} \cos\theta$$
$$Q = I_{rms} V_{rms} \sin\theta$$

14. De Morgan's theorem: $\overline{(X+Y)} = \overline{X} \bullet \overline{Y}$

$$\overline{X \bullet Y} = \overline{X} + \overline{Y}$$