1.

An antenna is connected to a voltage source with the voltage of $V_S$. The impedance of the antenna is $Z_A=R_A+jX_A$ and the internal impedance of the source is $Z_S=R_S+jX_S$. Find the average power delivered to the antenna.

2.

An antenna is connected to a voltage source with the voltage of $V_S$. The impedance of the antenna is $Z_A=R_A+jX_A$ and the internal impedance of the source is $Z_S=R_S+jX_S$. Find the available source power.

3.

An antenna is connected to a voltage source with the voltage of $V_S$. The impedance of the antenna is $Z_A=R_A+jX_A$ and the internal impedance of the source is $Z_S=R_S+jX_S$. Find the antenna mismatch efficiency.

4.

The far-field expression of the electric field produced by an antenna at the origin is given by

$$\mathbf{E}(r) = \frac{e^{-jkr}}{r} sin\theta\, \hat{\theta}$$

where $k$ is the waveguide number of free space. Find the magnetic field in the far-field zone.

5.

The far-field expression of the electric field produced by an antenna at the origin is given by

$$\mathbf{E}(r) = \frac{e^{-jkr}}{r} sin\theta\, \hat{\theta}$$

where $k$ is the waveguide number of free space. Find the total power radiated by the antenna.

6.

The far-field expression of the electric field produced by an antenna at the origin is given by

$$\mathbf{E}(r) = \frac{e^{-jkr}}{r} sin\theta \, \hat{\theta}$$

where $k$ is the waveguide number of free space. Find the beam solid angle.

7.

The far-field expression of the electric field produced by an antenna at the origin is given by

$$\mathbf{E}(r) = \frac{e^{-jkr}}{r} sin\theta \, \hat{\theta}$$

where $k$ is the waveguide number of free space. Find the directivity

8.

The current density of a z-directed infinitesimally short wire carrying harmonically oscillating current $I$ located at the origin is given by

$$\mathbf{J}(\mathbf{r}) = I\Delta z \, \delta(\mathbf{r}) \, \hat{z}$$

where $\Delta z$ is the length of the wire and $\mathbf{r}$ is the position vector. $\hat{z}$ is the unit vector in z direction, and $\delta$ is the Dirac delta function. Derive the magnetic vector potential.

9.

Two identical antennas having are at ($x$ = 0, $y$ = 0, $z$ = - $d$/2) and at ($x$ = 0, $y$ = 0, and $z$ = $d$/2). The two antennas are excited with the same current. Find the array factor.

10.

$N$ identical antennas equally spaced along the z-axis and they are uniformly excited. Find the normalized array factor.