z ←

2-6(c)

解: $\dot{U}(z) = 15e^{j20\pi z} - 5e^{-j20\pi z}$

$\dot{I}(z) = \frac{3}{10}e^{j20\pi z} + \frac{1}{10}e^{-j20\pi z}$

$i(z,t) = \frac{3}{10}\cos(3\pi\times10^9 t + 20\pi z) + \frac{1}{10}\cos(3\pi\times10^9 t - 20\pi z)$

反射系数: $\Gamma = \frac{-5e^{-j20\pi z}}{15e^{j20\pi z}} = -\frac{1}{3}e^{-j40\pi z}$

驻波比: $\rho = \frac{1+|\Gamma|}{1-|\Gamma|} = \frac{1+\frac{1}{3}}{1-\frac{1}{3}} = 2$

输入阻抗: $Z_{in} = Z_0\frac{1+\Gamma}{1-\Gamma} = 50\frac{1-\frac{1}{3}e^{-j40\pi z}}{1+\frac{1}{3}e^{-j40\pi z}}$

负载阻抗: $Z_L = Z_0\frac{1+\Gamma_2}{1-\Gamma_2} = 100\Omega$

2-10

解: 平行双导线特性阻抗

$Z_0 = 120\sqrt{\frac{\mu_r}{\varepsilon_r}}\ln\frac{D}{r}$

同轴线特性阻抗

$Z_0 = 60\sqrt{\frac{\mu_r}{\varepsilon_r}}\ln\frac{b}{a}$.

代入数据. 得

$D = 25.5\ mm$

$b = 3.91\ mm$

数学作业纸

班级：　　姓名：钱思远　编号：18373038　科目：微波 2-2作业　第　页

2-5

(b) 解：$u(z,t) = 100\cos(2\pi z)\cos(6\pi\times10^8 t)$

$= 50[\cos(6\pi\times10^8 t + 2\pi z) + \cos(6\pi\times10^8 t - 2\pi z)]$

$\dot{U}(z) = 50[e^{j2\pi z} + e^{-j2\pi z}]$

$f = \frac{\omega}{2\pi} = \frac{6\pi\times10^8}{2\pi} = 3\times10^8\ Hz$

$\lambda_p = \frac{2\pi}{\beta} = 1\ m$

$v_p = \frac{\omega}{\beta} = 3\times10^8\ m/s$.

入射波沿+z方向，反射波沿-z方向

2-6

(c) 解：$\dot{U}(z) = [10e^{j20\pi z} + 10j\sin(20\pi z)]$

$v_p = \frac{c}{\sqrt{\varepsilon_r\mu_r}} = 1.5\times10^8\ m/s$

$\beta = 20\pi$

$\omega = v_p\cdot 20\pi = 3\pi\times10^9\ rad/s$.

$f = \frac{\omega}{2\pi} = 1.5\times10^9\ Hz$

$\lambda_p = \frac{2\pi}{\beta} = 0.1\ m$.

∴瞬时表达式：

$u(z,t) = 15\cos(3\pi\times10^9 t + 20\pi z) - 5\cos(3\pi\times10^9 t - 20\pi z)$

入射波：$\dot{U}_i(z) = 15e^{+j20\pi z}$　$|\dot{U}_i| = 15\ mV$

反射波：$\dot{U}_n(z) = -5e^{-j20\pi z}$　$|\dot{U}_n| = 5\ mV$

2-7

2-5(b)

解：特性阻抗 $Z_0 = 50\Omega$

$i(z,t) = 2\cos(2\pi z)\cos(6\pi\times10^8 t)$

$\dot{I}(z) = 2[e^{j2\pi z} + e^{-j2\pi z}]$

反射系数

$\Gamma(z) = \frac{\dot{U}_r}{\dot{U}_i} = \frac{50e^{-j2\pi z}}{50e^{j2\pi z}} = e^{-j4\pi z}$

驻波比：

$\rho =$

输入阻抗：

$Z_{in}(z) = \frac{\dot{U}(z)}{\dot{I}(z)} =$

2-7

2-5(b)

解：$\dot{U}(z) = 50[e^{j2\pi z} + e^{-j2\pi z}]$

$\dot{I}(z) = e^{j2\pi z} - e^{-j2\pi z}$

$i(z,t) = \cos(6\pi\times10^8 t + 2\pi z) - \cos(6\pi\times10^8 t - 2\pi z)$

反射系数：$\Gamma(z) = e^{-j4\pi z}$

驻波比：$\rho = \frac{1+|\Gamma|}{1-|\Gamma|} = \infty$

输入阻抗：$Z_{in} = Z_0\frac{1+\Gamma(z)}{1-\Gamma(z)} = 50\frac{1+e^{-j4\pi z}}{1-e^{-j4\pi z}}$

负载阻抗：$Z_L = Z_0\frac{1+\Gamma_2}{1-\Gamma_2} = \infty$