四.

(1) $\begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix} = [S] \begin{bmatrix} a_1 \\ a_2 \\ a_3 \\ a_4 \end{bmatrix} \Rightarrow \begin{cases} b_1 = \frac{\sqrt{2}}{2}(a_3 + a_4) \\ b_2 = \frac{\sqrt{2}}{2}(a_3 + a_4) \\ b_3 = \frac{\sqrt{2}}{2}(a_1 - a_2) \\ b_4 = \frac{\sqrt{2}}{2}(a_1 + a_2) \end{cases}$

(2) 由 $a_3 = 0$. $\Gamma_1 = \frac{a_1}{b_1}$. $\Gamma_2 = \frac{a_2}{b_2}$.

则得 $b_1 = \frac{\sqrt{2}}{2} a_4$ $\quad b_1 = \frac{a_1}{\Gamma_1}$

$b_2 = \frac{\sqrt{2}}{2} a_4$ $\quad b_2 = \frac{a_2}{\Gamma_2}$

$b_3 = \frac{1}{2}(\Gamma_1 - \Gamma_2) a_4$ $\quad a_3 = 0$.

$b_4 = \frac{1}{2}(\Gamma_1 - \Gamma_2) a_4$.

(3) 由 $b_3 = \frac{1}{2}(\Gamma_1 - \Gamma_2) a_4$

$P_{out} = \frac{1}{4}(\Gamma_1 - \Gamma_2)^2 P_{in}$

当 $\begin{cases} \Gamma_1 = 1 \\ \Gamma_2 = -1 \end{cases}$ 或 $\begin{cases} \Gamma_1 = -1 \\ \Gamma_2 = 1 \end{cases}$ 时, P_{out} 最大

$\Gamma_1 = \Gamma_2$ 时, P_{out} 最小.

(4) 信号由④输入, 向①②传等幅同相波

调整标准负载. 使之与被测负载阻抗一致. 则两个负载反射回来的波保持等幅同相. 而③指示为0.

若①②负载不等, 则③~~指示不为0~~. 有指示, 调节标准负载使③指示为0

此时标准负载阻抗与被测负载阻抗相同.