

P7

# The Complete Smith Chart

## Black Magic Design

a.

$Z_L = 150 - j60$   $\xrightarrow{\text{正規化}}$   $z_L = \frac{Z_L}{Z_0} = \frac{150 - j60}{75} = 2 - j0.8$  (查圖)  
 $\xrightarrow{\text{By smith chart}}$   $|T_L| = 0.92$   $\angle T_L = -24^\circ$   $\therefore T_L = 0.92 \angle -24^\circ$

順時針推  $2 \times 75^\circ \Rightarrow -24 - 150 = -174^\circ$

$\therefore T_{m2} = 0.92 \angle -174^\circ = -0.92 - j0.09 \Rightarrow \frac{1+T_{m2}}{1-T_{m2}} = 0.41 - j0.09$

$\Rightarrow Z_{m1} = \frac{Z_m}{Z_1} = \frac{Z_2 Z_{m2}}{Z_1} = \frac{75(0.41 - j0.09)}{200} = 0.15 - j0.015$

查圖  $\xrightarrow{\text{By smith chart}}$   $T_{m1} = 0.92 \angle -138^\circ$

$\Rightarrow -178^\circ - 2 \times 130^\circ = -438^\circ$

$-438^\circ \rightarrow -78^\circ$

$\therefore T_a = 0.92 \angle -78^\circ$   
 $= 0.15 - j0.7$

b. By smith chart

找  $r = r_L$  的圓與實數交點。

$\Rightarrow \begin{cases} VSWR_1 = 6.8 \\ VSWR_2 = 2.4 \end{cases}$

c. By smith chart

$T_a = 0.15 - j0.7$

$\Rightarrow Z_a = 0.38 - j1.17$

$\Rightarrow Z_{ina} = Z_a \times 200 = 76 - j234j$

