

$$(1) Z_{in} = Z_0 \cdot \frac{Z_L + jZ_0 \tan \beta L}{Z_0 + jZ_L \tan \beta L}$$

$$\because Z_0 = 75 \Omega, Z_L = 150 - j50 \Omega$$

$$\beta = k = \frac{2\pi}{\lambda}, L = 5 \text{ cm} = 0.05 \text{ m}$$

$$\therefore Z_{in} = 49.9 + j45.5 \Omega$$

$$(2) \because v_p = \frac{\omega}{\beta}$$

$$\therefore 2\pi f = v_p \cdot \beta = 77\% c \cdot \frac{2\pi}{\lambda}$$

$$\therefore f = \frac{77\% c}{\lambda} = 3.85 \times 10^9 \text{ Hz} = 3.85 \text{ GHz}$$

$$(3) \Gamma_0 = \frac{Z_L - Z_0}{Z_L + Z_0}$$

$$SWR = \frac{1 + |\Gamma_0|}{1 - |\Gamma_0|} = 2.2845$$

