ELECENG 2FL3 ASSIGNMENT 5

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Variation #37
Z_0 = 75 ohm, L = 0.2054 m

a) The reflection coefficient at the load is equal to 0.0050 - 0.0705j

$$\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0}$$
$$\omega = 2 * \pi * f$$
$$Z_L = R_s + j\omega L_s + \frac{1}{j\omega C_s}$$
$$= 75 + j * 2 * \pi * 3 * 10^9 * 1.0 * 10^{-9} + \frac{1}{j * 2 * \pi * 3 * 10^9 * 1.8 * 10^{-12}}$$
$$= 75 - 10.6236j$$
$$\Gamma = \frac{(75 - 10.6236j) - 75}{(75 - 10.6236j) + 75}$$
$$= 0.0050 - 0.0705j$$

b) The SWR in the line is equal to 1.1521

$$SWR = \frac{1 + |\Gamma|}{1 - |\Gamma|}$$
$$= \frac{1 + |0.0050 - 0.0705j|}{1 - |0.0050 - 0.0705j|}$$
$$= 1.1521$$

c) The input impedance is equal to 68.6057 - 7.8963j

$$c = 299\ 792\ 458\ m/s$$
$$Z_{in} = Z_0 * \left[\frac{Z_L + jZ_0 \tan(\beta L)}{Z_0 + jZ_L \tan(\beta L)}\right]$$
$$= 75 * \left[\frac{(75 - 10.6236j) + j75 \tan(\frac{2\pi * 3 * 10^9}{c} * 0.2054)}{75 + j(75 - 10.6236j) \tan(\frac{2\pi * 3 * 10^9}{c} * 0.2054)}\right]$$
$$= 68.6057 - 7.8963j$$