EE5801 Tutorial 4

Q1

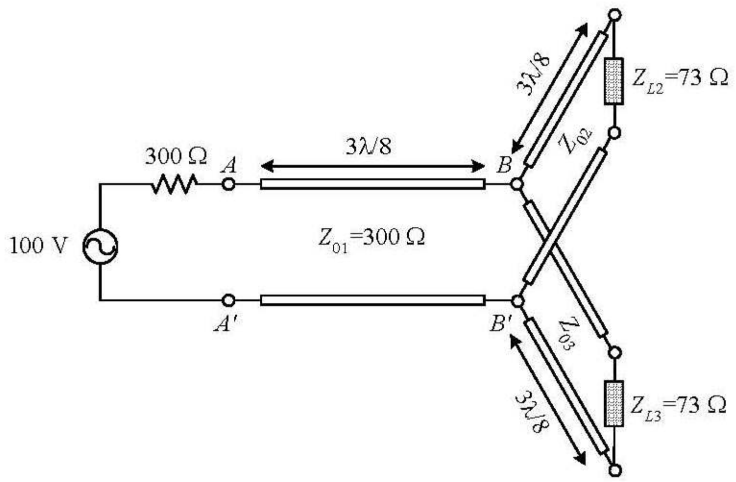
Consider a coaxial line with a dielectric constant of $\varepsilon_r = 2.9$ for the material filling the space between the inner and the outer conductors. The characteristic impedance of the coaxial line is $Z_o = 75\ \Omega$. The length of the coaxial line is 38 mm. The operating frequency is at 2 GHz and the line is terminated with a 300 Ω resistor. Determine the impedance looking into this line.

Q2

If a transmitter circuit is grounded via a copper (conductivity $6\text{x}10^7$ S/m) strip of wide 2cm, thickness 3mm, and length 20cm to a ground point. The strip has an average height of 1cm above ground. Assuming that the circuit is operating at 800MHz, determine the impedance at the circuit ground point, if (i) the ground impedance is 0Ω, and (ii) the ground impedance is 5Ω. (Note: This is a typical problem where there are many information which need not be used.)

Q3

Consider the transmission line circuit shown below. Two antennas, each of impedance $Z_{L2} = Z_{L3} = 73\Omega$, are fed with lossless lines from a generator. Determine the average power delivered to each antenna if $Z_{02} = 150\ \Omega$, $Z_{03} = 100\ \Omega$.



Q4 (This question is included for interest and information, will not be part of exam)

A stub-matching circuit is to be designed to match a low-noise amplifier (LNA) to a feeding transmission line with a characteristic impedance $Z_0 = 50\ \Omega$, as shown below. If the input impedance of the LNA is $Z_{in} = 35+j10\ \Omega$, by using the Smith chart technique, design a single parallel stub matching circuit to match the LNA to the transmission line so that no reflection occurs along the transmission line after the stub. Use an open-circuit stub with the same characteristic impedance as the transmission line. State the length of the stub L and the position of the stub from the antenna d in terms of wavelength.