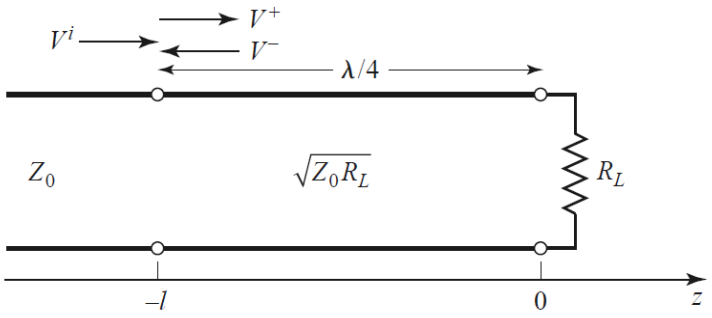
Benha University
Faculty of Engineering at Shoubra
Electrical Engineering Department

Microwave fundamentals
3rd Year Communications
(2018-2019)

Sheet 3

1. A terminated transmission line with Z0 = 60 Ω has a reflection coefficient at the load of $\Gamma = 0.4 \lfloor 60^o$. (a) What is the load impedance? (b) What is the reflection coefficient 0.3λ away from the load? (c) What is the input impedance at this point?
2. A 100 Ω transmission line has an effective dielectric constant of 1.65. Find the shortest open-circuited length of this line that appears at its input as a capacitor of 5 pF at 2.5 GHz. Repeat for an inductance of 5 nH.
3. A radio transmitter is connected to an antenna having an impedance 80 + j40 Ω with a 50 Ω coaxial cable. If the 50 Ωtransmitter can deliver 30 W when connected to a 50 Ω load, how much power is delivered to the antenna?
4. For a purely reactive load impedance of the form ZL = j X, show that the reflection coefficient magnitude $|\Gamma|$ is always unity. Assume that the characteristic impedance Z0 is real.
5. Design a quarter-wave matching transformer to match a 40 Ω load to a 75 Ω line
6. Consider the quarter-wave matching transformer circuit shown in the accompanying figure. Derive expressions for V^+ and V^-, the respective amplitudes of the forward and reverse traveling waves on the quarter-wave line section, in terms of V^i, the incident voltage amplitude.



Good Luck

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