**NEW YORK CITY COLLEGE OF TECHNOLOGY**

**TCET TELECOMMUNICATION ENGINEER DEPARTMENT**

**TCET 2220: TRANSMISSION SYSTEM**

**PROFESSOR: VIVIANA VLADUTESCU**

**SMITH CHART**

**FINAL PROJECT BY SALAM SECK**

**Project 1**

**Guidelines: Please type all the solutions! For the Smith Chart use Tools/ Typewriter to inset symbols or text. Email and UPLOAD your project 1 on your ePortfolio. In addition to this poject you also need to upload Project 2 and the reflections on the seminars/workshops/field trips, and email them to me.**

1. A 0.334λ long Z0=50 Ω T-line is terminated in a load ZL=100-j100 Ω. Calculate and use the Smith Chart to find:

a)ΓL;

**zL = = = 2 – j2** the value is shown in P1 on the Smith chart, and the operating circle in then constructed.

The initial coordinate on the ‘’ Wavelengths toward generator’’ scale is about **0.291λ.** We must rotate clockwise by **0.35λ,** so this would call for a final coordinate of **0.291λ + 0.35λ = 0.641λ.** However, this value exceeds **0.5λ,** so we subtract **0.5λ** to obtain a coordinate of **0.641λ – 0.5λ = 0.141λ.** The corresponding point is **P2** on the Smith chart. The value of the impedance is read as: **zin =0.55 + j1.18**

The VSWR is read from the intersection of the operating circle with the right half of the real line and is approximately: **S = 4.4**

The magnitude of the reflection coefficient is determined as:

**𝝘L =**

The angle of the reflection coefficient at the load is about **-300.** Thus, the reflection coefficient at the load is about: **𝝘’L = 0.63˪-300 = [() = -0.523]**

**𝝘’L = 0.63˪-0.523;** where the latter angle is **-0.523rad.**

b)VSWR;

The VSWR is read from the intersection of the operating circle with the right half of the real line and is approximately: **S = 4.4**

c)Zin seen by the source.

The corresponding actual impedance is:

**Zin = (50) (0.55 + j1.18) = 27.5 + j59**

1. Suppose a Z0=50 Ω T-line is is terminated in a 100 Ω load. Determine the aquired impedance of a quarter-wave matching section of T-line.

**Find Z1: Z1 = = = 70.71Ω**

1. Suppose a 50 Ω coaxial cable made with a Teflon dielectric, that must operate at 800MHz T-line is terminated in a ZL=10 - j15 Ω. Use the Smith Chart to
2. Create a matching network by adding a reactive element at a suitable location along the T-line:

**ZL = 10 – j15Ω**

**F = 800MHz**

**Z0 = R0 = 50Ω**

**zL = = = 0.2 – j0.3Ω**

1. determine the length of the coaxial line between the load and the capacitor:

At point **P3**, the normalized addmitance is about **ynew = 1 - j1.58**

The required value of admittance for the stub **P4** is **ynew = + j1.58**

**d = 0.5λ – 0.291λ= 0.209λ + 0.141λ = 0.35 λ**

**l = 0.178λ – 0.141λ = 0.036λ**

1. determine the value of the series capacitor added to provide an impedance match:

**1.58j = Xc**

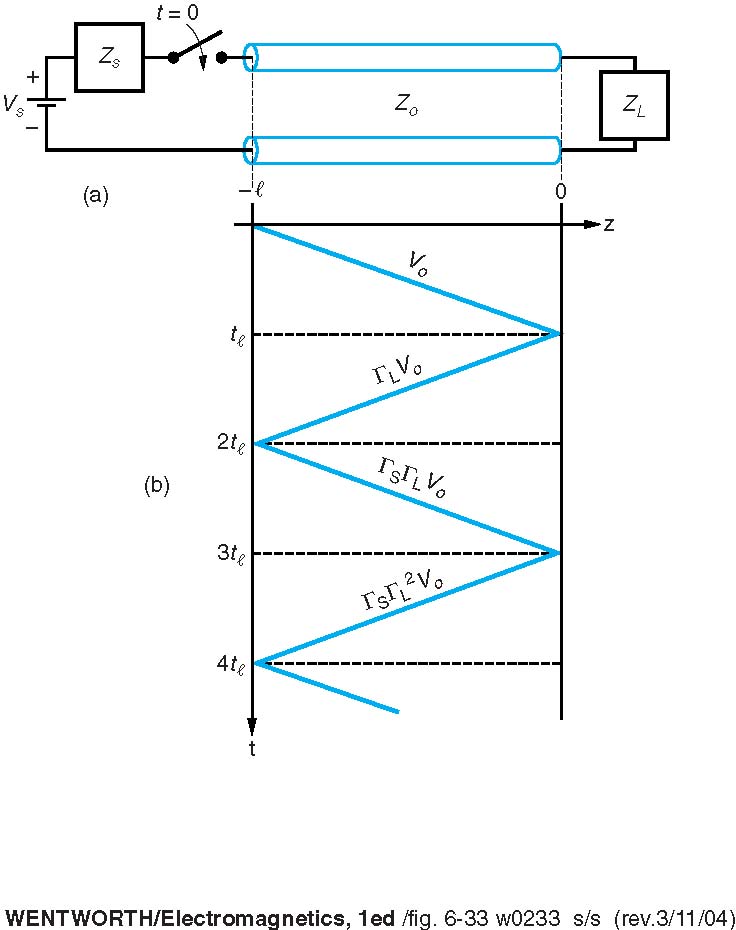
**1.58j =**

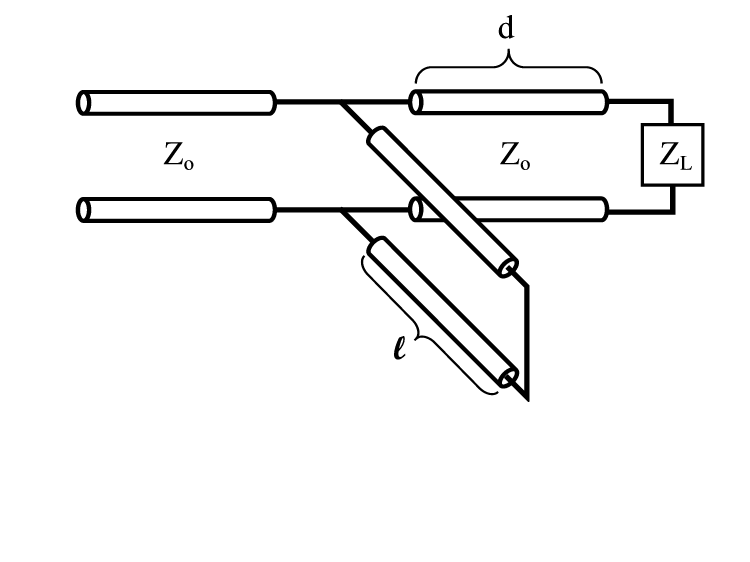
**1.58j =**

**1.58 =**

**C =**

**C = 1.26pf**

1. You would like to match a 170Ω load to a 50 Ω T-Line.



(a) Determine the characteristic impedance required for a quarter-wave transformer.

**R10 = = 92.19Ω**

**Zs = 92.19 []**

**Zs = 42.66Ω**

1. Consider a 6 cm long 75 Ω transmission line terminated in a 125 Ω load and having a matched source impedance (*Zs* = 25 Ω). Propagation velocity on the T-Line is 0.1*c*. The source is a 0.4 ns square pulse of amplitude 4V.

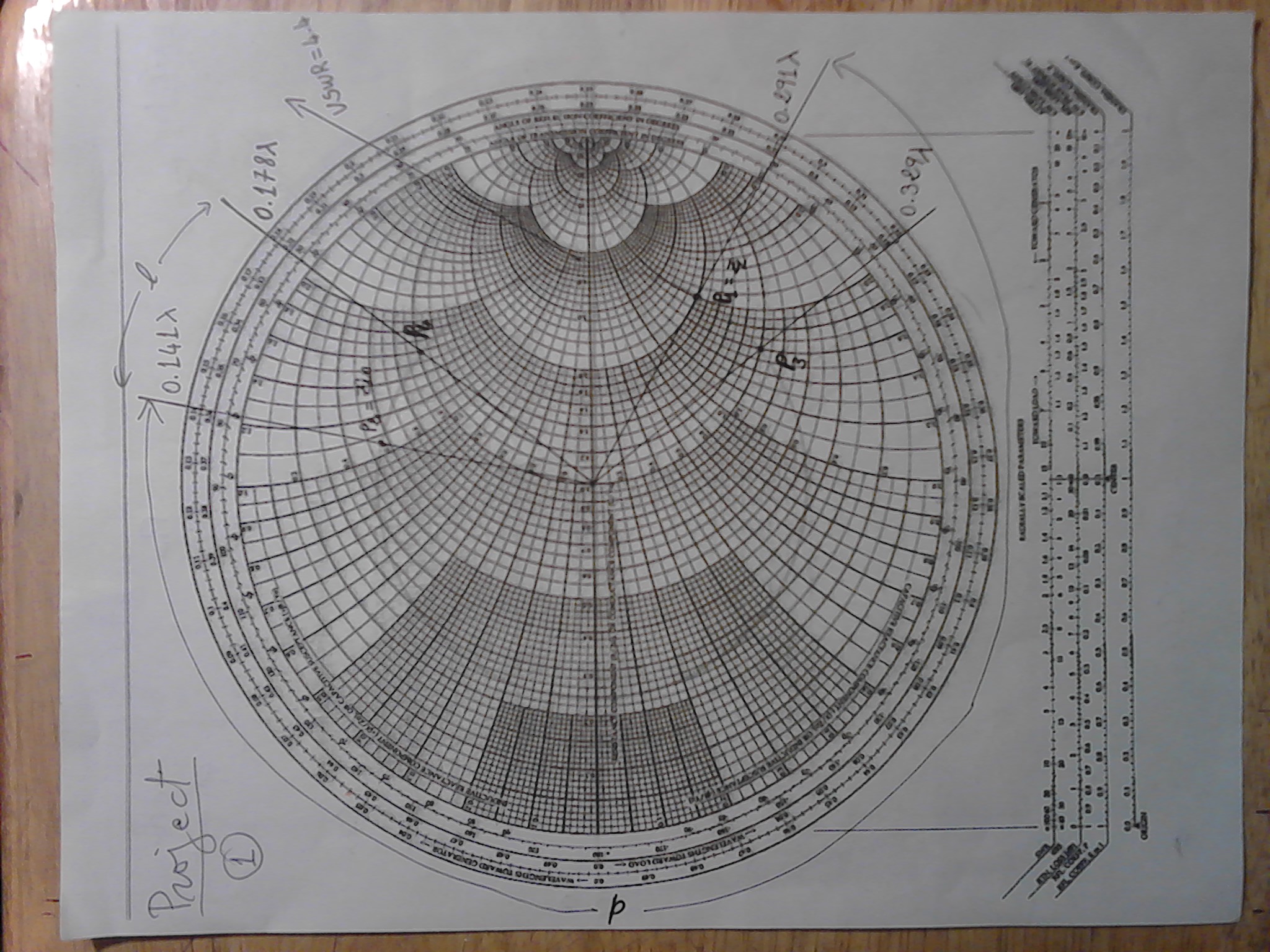
**V+1 = = = 3.33V**

**VL = = = 5.39V**

**V-1= (V+1) ( = (3.33) (0.62) = 2.06V**

**VOLTAGE STEADY STATE IS:**

**V+1 + V-1 = 3.33V + 2.06V = 5.39V**

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