H1

1. A 2.4 GHz clock generator produces a square wave that is "low" 50% of the time and "high" 50% of the time. It feeds into a parallel plate transmission line that extends 32 cm to a load. At the instant t = 10 μS, V_G switches from "low" to "high". How many clock cycles is the load behind the generator?

2. A two-wire air line has the following line parameters: R' = 0.404 mΩ/m, L' = 2.0 μH/m, G' = 0, C' = 5.56 pF/m. For operation at 5 kHz, determine:
   a) The attenuation constant α.
   b) The phase constant β,
   c) The phase velocity u_p.
   d) The characteristic impedance Z_0.

3. A distortionless transmission line operating at 125 MHz has Z_0 = 40 Ω, α = 0.02 Np/m, and β = 0.75 rad/m. Find the line parameters R', L', G', and C'.

   {A neper (Symbol: Np) is a unit of ratio. It is not an SI unit but is accepted for use alongside the SI. It is used to express ratios, such as gain and loss, and relative values. The name is derived from John Napier, the inventor of logarithms.}

H2

1. A 50 Ω lossless transmission line is terminated in a load impedance Z_L = (30 – j200) Ω. Calculate the voltage reflection coefficient at the load without using the Smith chart method.

2. A 100 Ω lossless transmission line is terminated in a load impedance Z_L = (200 – j200) Ω. Calculate the voltage reflection coefficient at the load using the Smith chart method.

H3

1. If Γ = 0.5 $\angle$ -60º and λ = 24 cm, find the locations of the voltage maximum and minimum nearest to the load. Use the formulas first to compute the exact answer. Then use the Smith chart to check your answer. Turn in the Smith chart with your assignment.
2. Use the Smith chart to find the normalized input impedance of a lossless line of length ℓ = 0.3 λ terminated in a normalized load impedance z_L = 1 – 1 j.
3. A 60 Ω resistive load is preceded by a λ/4 section of a 50 Ω lossless line, which itself is preceded by another λ/4 section of a 100 Ω lossless line. What is the input impedance?

Smith charts can be downloaded from D2L.