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Homework 4, Chapter 3

10-30-13

**(3-1) A traveling wave of current in milliamperes is given by**

**with t in seconds and x in meters. Determine the following:**

1. **Direction of propagation**

Since the argument of the function has the difference between the time and displacement terms, the wave is traveling in the positive x-direction

1. **Peak value**
2. **Angular frequency**
3. **Phase constant**
4. **Cyclic frequency**
5. **Period**
6. **Wavelength**
7. **Velocity of propagation**

**(3-2) A traveling wave of voltage in volts in given by**

**with t in seconds and x in meters. Determine the following:**

1. **Direction of propagation**

Since the argument of the function has the difference between the time and displacement terms, the wave is traveling in the negative x-direction

1. **Peak value**
2. **Angular frequency**
3. **Phase constant**
4. **Cyclic frequency**
5. **Period**
6. **Wavelength**
7. **Velocity of propagation**

**(3-3) A sinusoidal current with a peak value of 2 A and a frequency of 50 MHz is traveling in the positive x-direction with a velocity of Determine the following:**

1. **Period**
2. **Angular Frequency**
3. **Phase constant**
4. **Wavelength**
5. **An equation for the current**

**(3-4) A sinusoidal voltage with a peak value of 25 V and a radian frequency of 20 Mrad/s is traveling in the negative x-direction with a velocity of Determine the following:**

1. **Cyclic frequency**
2. **Period**
3. **Phase constant**
4. **Wavelength**
5. **An equation for the current**

**(3-5) Consider the current traveling wave of Problem 3-1. Determine the following:**

1. **A fixed phasor representation in peak units as either or (You decide which label is appropriate.)**
2. **The corresponding distance-varying phasor**  **in peak units**
3. **The wave of the distances-varying phasor at x = 100 m.**

**(3-6) Consider the voltage traveling wave of Problem 3-2. Determine the following:**

1. **A fixed phasor representation in peak units as either or (You decide which label is appropriate.)**
2. **The corresponding distance-varying phasor**  **in peak units.**
3. **The wave of the distances-varying phasor at x = 4 m**

**(3-7) Repeat the analysis of Problem 3-5 if the current of Problem 3-1 has a fixed phase shift such that it is described by**

1. **A fixed phasor representation in peak units as either or (You decide which label is appropriate.)**
2. **The corresponding distance-varying phasor**  **in peak units**
3. **The wave of the distances-varying phasor at x = 100 m.**

**(3-8) Repeat the analysis of Problem 3-6 if the voltage of Problem 3-2 has a fixed phase shift such that it is described by**

1. **A fixed phasor representation in peak units as either or (You decide which label is appropriate.)**
2. **The corresponding distance-varying phasor**  **in peak units.**
3. **The wave of the distances-varying phasor at x = 4 m**

**(3-9) Redefine the fixed phasor of Problem 3-5 so that the phasor magnitude is expressed in rms units, and determine the average power dissipated in a 50- resistance.**

**(3-10) Redefine the fixed phasor of Problem 3-6 so that the phasor magnitude is expressed in rms units, and determine the average power dissipated in a 75- resistance.**

**(3-11) Redefine the fixed phasor of Problem 3-7 so that the phasor magnitude is expressed in rms units. Would the power dissipated in a 50- resistance be the same as in Problem 3-9?**

Yes they are the same.

**(3-12) Redefine the fixed phasor of Problem 3-8 so that the phasor magnitude is expressed in rms units. Would the power dissipated in a 75- resistance be the same as in Problem 3-10?**

Yes they are the same.

**(3-13) Under steady-state ac conditions, the forward current wave on a certain lossless 50- line is = . Determine the voltage forward wave.**

**(3-14) Under steady-state ac conditions, the forward current wave in 300 lossless line is = . Determine the current forward wave.**

**(3-15) Under steady-state ac conditions, the reverse voltage wave on a lossless 50 line is = V. Determine the reverse current wave.**

**(3-16) Under steady-state ac conditions, the reverse current wave on a lossless 75- line is = . Determine the reverse voltage wave.**

**(3-17) A table of specifications for one version of RG - 8/U 50- coaxial cable indicates that the attenuation per 100 ft. at 50 MHz is 1.2 dB. At this frequency, determine the following:**

1. **Attenuation factor in decibel per foot**
2. **Attenuation factor in nepers per foot**

**For a length of 300 ft. determine the following:**

1. **Total attenuation in decibel**
2. **Total attenuation in nepers**
3. **Ratio using both decibels and nepers for a single wave**

In terms of decibels, this ratio may be expressed as

**(3-18) A transmission line has an attenuation of 0.05 dB/m. Determine the following:**

1. **Attenuation factor in nepers/m**

**For a length of 400 m, determine the following:**

1. **Total attenuation in decibel**
2. **Total attenuation in nepers**
3. **Ratio using both decibels and nepers for a single wave**

**In term of decibles:**

**(3-19) A single-Frequency wave is propagating in one direction on a transmission line of length 200m. with an input rms voltage of 50 V, the output rms voltage is measured as 20 V. Determine the following:**

1. **Total attenuation in decibel**
2. **Total attenuation in nepers**
3. **Attenuation factor in decibel/meter**
4. **Attenuation factor in nepers/meter**

**(3-20) A single-Frequency wave is propagating in one direction on a transmission line of length 400m. The input power to the line is 40 W, and the output power is 12 W. Determine the following:**

1. **Total attenuation in decibel**
2. **Total attenuation in nepers**
3. **Attenuation factor in decibel/meter**
4. **Attenuation factor in nepers/meter**

**(3-21) A transmission line has the following parameters at 50 MHz: , , and . Determine the following:**

1. **Z**
2. **Y**

= 22.36 \* 10-3  + j1.088

α = 22.36 x 10-3 Np/m

= j1.008 rad/ft

1. **v**

**(3-22) A lossy audio-frequency line has the following parameters at 2 kHz: , , and . Determine the following:**

1. **Z**
2. **Y**

= 5 x 10-5  + j5.029 x 10-5

α = 5 x 10-5 Np/ft

= j5.029 x 10-5 rad/ft

1. **Attenuation in dB/ft**
2. **v**

**(3-23) A coaxial cable has the following parameters at a frequency of 1 MHz:**

**series resistance = 0.3**

**series reactance = 2**

**shunt conductance = 0.5 uS/m**

**shunt susceptance = 0.6 mS/m**

**Determine the following:**

Z = 0.3 + j2 Ω/m = 2.022

Y = 0.5µ + j0.6m S/m = 0.6m

=

α = 2.6m Np/m

1. **Attenuation in dB/ft**

αdB  dB/m

1. **V**

**(3-24) For the coaxial cable of problem 3-23, repeat the analysis at 100 MHz if the series resistance increases to 1 , but the shunt conductance remains essentially the same. (Note: You must apply basic ac circuit theory to determine the new values for the reactance and susceptance.)**

1 + j200 = 200 Ω/m

Y = G + jB = 0.5 x 10-6 +

= 0.5 x 10-6 + j0.06 = 0.06 S/m

=

= 8.3m + j3.46

α = 8.3m Np/m

ϐ = 3.46 rad/m

1. αdB = 8.69 x 8.3 x 10-3 = 0.072 dB/m
2. m/s

= 57.74 Ω = 57.74 – j0.139

**(3-25) For the circuit of fig. P3-25, determine the following:**

1. **Input current**
2. **Input Voltage**

V

1. **Input power**
2. **Load current**
3. **Load Voltage**
4. **Load Power**
5. **Line loss in dB**

**(3-26) For the circuit of fig. P3-26, determine the following:**

1. **Input current**
2. **Input Voltage**

Ω

V

1. **Input power**
2. **Load current**
3. **Load Voltage**
4. **Load Power**
5. **Line loss in nepers**