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HW 4

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

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) 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

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

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.

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

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.

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

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.

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.

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.**

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.**

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

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

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

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

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 ft
2. Attenuation factor in np per ft

For a length of 300 ft. determine the following:

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

In the RMS of decibels, this ratio may be expressed as

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

1. Attenuation factor in np/m

For a length of 400 m, determine the following:

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

In term of decibles:

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 np
3. Attenuation factor in decibel/meter
4. Attenuation factor in np/meter

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 np
3. Attenuation factor in decibel/meter
4. Attenuation factor in np/meter

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

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

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

Find:

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

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.

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

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

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 np