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TCET2220

HW # 2

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Chapter 1

1.1-1.32

1. Calculate the free space wavelength in meter for the following frequencies:
2. 2kHz
3. 200kHz
4. 20 MHz
5. 2 GHz
6. Calculate the free space wavelength in meter for the following frequencies:
7. 80 kHz
8. 8 MHz
9. 800 MHz
10. 8 GHz
11. Calculate the free space wavelength in miles for the frequency of 400 Hz.
12. Calculate the free space wavelength in miles for the frequency of 1.5 kHz.
13. A sinusoidal signal has a free-space wavelength of 80 m. calculate the frequency.
14. A sinusoidal signal has a free-space wavelength of 6 m. calculate the frequency.
15. A digital signal utilizes pulses whose minimum widths are about 3 ns. Assuming the speed of light, determine the longest lengths of wire-pair that can be allowed based on the 10% rule.
16. The longest connecting wires in a digital system are about 20 cm. assuming the speed of light, determine the shortest acceptable pulse width based on the 10% rule.
17. A communication system operates a frequency of 800 MHz. Assuming the speed of light, determine the length of connecting line that could be used without considering frequency- domain effects based on the 10% rule.
18. The length of a connecting cable between two points in a radio frequency system is 50 cm. Assuming the speed of light, determine the high operating frequency that should be used without considering frequency domain effects based on the 10% rule.
19. In a coil, a current of 100 mA results in magnetic flux of 50 µWb. Determine the inductance.
20. A current of 4 mA is flowing in a 20 µH coil. Determine the magnetic flux.
21. In a capacitor, a voltage of 20V result in charge storage of 5 µC. Determine the capacitance.
22. A capacitance of 40 µF is charged to a voltage of 12 V. Determine the electric charge.
23. A lossless transmission line has an inductance of 320 nH/m and a capacitance of 57 pF/m. Determine the characteristic impedance.
24. A lossless transmission line has an inductance of 1.2 µH/m and a capacitance of 15 pF/m. determine the characteristic impedance.
25. The dielectric constant of mica is 6. Determine the permittivity.
26. The permittivity of a material is 14X10-12 F/m. Determine the dielectric constant.
27. The permeability of nickel is 800. Determine the actual permeability.
28. The permeability of a ferromagnetic material is 10-4 H/m. Determine the relative permeability.
29. Determine the velocity of propagation of the transmission line of problem 15.
30. Determine the velocity of propagation of the transmission line of problem 16.
31. The dielectric constant in a transmission line is 4.7 and µ=. Determine the velocity of propagation.
32. The dielectric constant in a certain transmission line is 3 and µ=. Determine the velocity of propagation.
33. A coaxial cable has the following specification: , and velocity of propagation = 2.1X108 m/s. Determine L and C.
34. A transmission line has the following specification:, and velocity factor of 0.8. Determine L and C.
35. The lower end of a commercial AM band is about 550 KHz. AM station use “quarter wave” vertical antenna whose length are 0.25λ. Determine the length in meters of a vertical antenna operating at the lower end.
36. The upper end of a commercial AM band referred to problem 27 is about 1610 KHz. Determine the length in meters of a vertical antenna operating at the upper end.
37. One popular single antenna is the “half wave” horizontal antenna whose theoretical length is 0.5λ at the operating frequency. In practice, however, the antenna is usually shortened by about 5% due to the end effect. Determine the practical length in meters for a half wave antenna to provide optimum reception at the lower end of the commercial FM band, which is about 88 MHz.
38. Based on the discussion of problem 29, determine the practical length in meters for a half wave antenna to provide optimum reception at the upper end of the FM band, which is 108 MHz.
39. Show that the free space velocity of light in feet/second is very closed to 982X106

ft/s.

1. Show that the free space wavelength in feet can be expressed as .