End of Chapter 14 Exercises

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14.12) A waveform travels in space at a rate of approximately 300 million meterers per second. The wavelength of sine wave is the actual distance in space that is used by one sine wave as it travels.

a) What is the wavelength of a 100-MHz sine wave?

b) What is the wavelength of a 500-MHz sine wave?

Antennas to send and receive electronic waves are often sized to be one-half of the wavelength of the particular wave being used. Compare your previous calculations to the size of VHF and UHF tellevission antennas.

c) How large would a ½ wavelength antenna have to be to transmit a 60 Hz wave?

Answer) a) Wavelength $\lambda = \frac{c}{f}$

where - $c = 3 \times 10^8$ m/s (speed of light)

$f = 100$ MHz $= 100 \times 10^6$ Hz

$\lambda = \frac{c}{f} = \frac{3 \times 10^8 \text{ m/s}}{100 \times 10^6 \text{ Hz}} = 3 \text{ m}$

b) Wavelength $\lambda = \frac{c}{f}$

where - $c = 3 \times 10^8$ m/s (speed of light)

$f = 500$ MHz $= 500 \times 10^6$ Hz

$\lambda = \frac{c}{f} = \frac{3 \times 10^8 \text{ m/s}}{500 \times 10^6 \text{ Hz}} = 0.6 \text{ m}$

→ VHF antennas : A wavelength is ¼ the length of the antenna : 1m - 10m

→ UHF antennas : UHF antennas are 12-24 inches

c) $\lambda = \frac{c}{f}$.

where $c = 3 \times 10^8 m/s$

$f = 60Hz$

$\lambda = \frac{c}{f} = \frac{3 \times 10^{8}}{60Hz} = 5 \times 10^6 m$

Size of antenna is ½ of wave length

$d = \frac{\lambda}{2} = \frac{5 \times 10^6 m}{2} = 2.5 \times 10^6 m = 2500,000m$

14.17) Draw a diagram that represents 00·1011 1010 0010. Below the original diagram draw the Manchester representation of the sequence.