6.1, 6.6, 6.7, 6.12, 6.15

1. For radio transmission in free space signal power is reduced in proportion to the square of distance from the source whereas in wire transmission attenuation is a fixed number of Db per kilometre. The following table is used to show the Db reduction relative to some reference for free space radio and uniform wire. Fill the missing numbers to Complete the table.

|  |  |  |
| --- | --- | --- |
| Distance(KM) | Radio(dB) | Wire(dB) |
| 1 | -6 | -3 |
| 2 |  |  |
| 4 |  |  |
| 8 |  |  |
| 16 |  |  |

1. Suppose a transmitter produces 50Watts of Power.   
   a. Express transmit power in dBm and dBW.  
   b. If a transmitter’s power is applied to Unity gain Antenna with 900MHz carrier frequency, what ---is the free space power in dBm at a free space distance of 100m?  
   c. Repeat (b) for 10Km  
   d. Repeat (C) for antenna gain 2
2. Instead of assuming free space environment in 6.6 assume an urban area cellular radio scenario. Path loss exponent n=3.1 and a transmitter power of 50W.  
   a. What is the range of path loss exponent for this environment?  
   b. If a transmitter’s power is applied to Unity gain Antenna with 900MHz carrier frequency, what ---is the free space power in dBm at a free space distance of 100m?
3. Determine the height of the Antenna for TV stations that must be able to reach customers 80Kms away. Use Okumura-Hatta Model for rural environment with fc=75Mhz and Hr=1.5m. Transmitter power 150Kw and received power must be greater than 10^-13 W
4. Suppose a car is moving through the suburban environment that has a wireless channel with a coherence time of 10ms and the coherence bandwidth of 600Khz. The bitrate of system used is 50kbps. Characterize the channel.  
   a. Is the channel slow or fast fading?  
   b. Is the channel flat or frequency selective fading?