CHAPTER 7 : Transmission Media

Solutions to Review Questions

Review Questions

1. ***Guided media*** have physical boundaries, while ***unguided media*** are unbounded.

2. ***Omnidirectional*** waves are propagated in all directions; ***unidirectional*** waves are propagated in one direction.

3. ***Refraction*** and ***reflection*** are two phenomena that occur when a beam of light travels into a less dense medium. When the angle of incidence is less than the critical angle, ***refraction*** occurs. The beam crosses the interface into the less dense medium. When the angle of incidence is greater than the critical angle, ***reflection*** occurs. The beam changes direction at the interface and goes back into the more dense medium.

4. The three major categories of guided media are ***twisted-pair***, ***coaxial***, and ***fiberoptic*** cables.

5. The ***inner core*** of an optical fiber is surrounded by ***cladding***. The core is denser than the cladding, so a light beam traveling through the core is reflected at the boundary between the core and the cladding if the incident angle is more than the critical angle.

6. The ***transmission media*** is located ***beneath the physical layer*** and controlled by the physical layer.

7. ***Twisting*** ensures that both wires are equally, but ***inversely***, affected by external influences such as noise.

8. In ***sky propagation*** radio waves radiate upward into the ionosphere and are then reflected back to earth. In ***line-of-sight propagation*** signals are transmitted in a straight line from antenna to antenna.

9. The two major categories are ***guided*** and ***unguided*** media.

10. *We can mention three advantages of optical fiber cable over twisted-pair and coaxial cables:* ***noise resistance***, ***less signal attenuation***, *and* ***higher bandwidth.***

Exercises

12. See Table 7.1 (the values are approximate).

Table 7.1 *Solution to Exercise 12*

Distance	*dB at 1 KHz*	*dB at 10 KHz*	*dB at 100 KHz*
1 Km	**−3**	**−5**	**−7**
10 Km	**−30**	**−50**	**−70**
15 Km	**−45**	**−75**	**−105**
20 Km	**−60**	**−100**	**−140**

15. As Table 7.2 shows, for a specific maximum value of attenuation, the highest frequency decreases with distance. If we consider the bandwidth to start from zero, we can say that the bandwidth decreases with distance. For example, if we can tol-erate a maximum attenuation of 50 dB (loss), then we can give the following listing of distance versus bandwidth.

Distance	*dB at 800 nm*	*dB at 1000 nm*	*dB at 1200 nm*
1 Km	**−3**	**−1.1**	**−0.5**
10 Km	**−30**	**−11**	**−5**
15 Km	**−45**	**−16.5**	**−7.5**
20 Km	**−60**	**−22**	**−10**

18. We can use the formula $f = c / \lambda$ to find the corresponding frequency for each wave length as shown below (c is the speed of propagation):

a. $B = [(2 \times 10^8)/1000 \times 10^{-9}] - [(2 \times 10^8)/ 1200 \times 10^{-9}] =$ **33 THz**
b. $B = [(2 \times 10^8)/1000 \times 10^{-9}] - [(2 \times 10^8)/ 1400 \times 10^{-9}] =$ **57 THz**