3170103240-张佳瑶-homework2

1

> “Fast” Ethernet operates 10x faster (100Mbps) than regular ethernet.Explain why the following changes were made. (a) Encoding changed to 4B/5B. (b) CAT-5 cable has more twists.

(a)数字电话线要求不能传输太多的0， 4B/5B编码方式使得最终发射的信号中没有太多的连续的0。根据一张固定的转换表，每4个比特被映射成一个5比特模式。5位比特模式使得映射结果永远不会出现连续三个0

(b)5类线每米内的双绞线纽得更紧，单位长度内缠绕地更紧可以导致更少的干扰，而且在长距离传输过程中还能使信号质量更好，使得5类线更适合高速计算机通信。

2

> If a binary signal is sent over a 3-kHz channel whose signal-to- noise radio is 20dB, what is the maximum achievable data rate?

根据$10\log_{10}(S/N)=20dB$，得$S/N=100$。

最大可达到的数据速率为$2H\log_2(1+S/N) = 2*3kHz * \log_2101 = 6\log_2101$ kbps。

3

> What are the advantages of fiber optics over copper as a transmission medium? Is there any downside of using fiber optics over copper?

优势：

1. 更高的带宽和低衰减
2. 不受电涌、电磁波、电源故障的干扰
3. 不受空气中腐蚀性化学品的影响
4. 轻薄
5. 光纤不会漏光且抗击打

劣势：

1. 光纤是一项不太熟悉的技术
2. 光纤接口更贵

4

> Is the Nyquist theorem true for high-quality single-mode optical fiber or only for copper wire?

Nyquist theorem适用于所有的传输媒介。

5

> What is the minimum bandwidth needed to achieve a data rate of B bits/sec if the signal is transmitted using NRZ and Manchester encoding? Explain your answer.

NRZ编码每两个比特在正负电压之间循环，根据Nyquist theorem，至少需要B/2 Hz的带宽才能获取B bps的比特率。由于时钟信号，曼彻斯特编码需要两倍于NRZ编码的带宽，因此至少需要B Hz的带宽才能获取B bps的比特率

6

> Is an oil pipeline a simplex system, a half-duplex system, a full- duplex system, or none of the above? What about a river or a walkie- talkie-style communication?

单工系统是指通信是单向的，一方只能发送信号，另一方只能接收信号。双半工系统是指可以双向通信但不能同时进行。全双工系统是指可以同时双向通信。

输油管道应该是双半工系统。

7

> A modem constellation diagram similar to Fig. 2-23 has data points at the following coordinates: (1,1), (1,-1), (-1,1), (-1,-1). How many bps can a modem with these parameters achieve at 1200 symbols/sec?

每个波特有4个合法值，因此比特率是波特率的两倍，调制解调器在1200symbols/sec时能达到2400bps。

8

> What is the difference, if any, between the demodulator part of a modem and the coder part of codec? (After all, both convert analog signals to digital ones.)

调制解调器执行数字比特流和模拟信号流之间的转换。调制器将模拟信号流转换为数字比特流，解调器将数字信号流转换为模拟信号流。

9

> What is the available user bandwidth in an OC-12c connection?

12*87 = 1044columns

(1044-1) * 9 * 8 * 8000 = 600.768Mbps

10

> Suppose that A, B, and C are simultaneously transmitting 0 bits, using a CDMA system with the chip sequences of Fig. 2-28(a). What is the resulting chip sequence?

S = 取反A+取反B+取反C = （3 1 1 1 -1 1 -3 1）