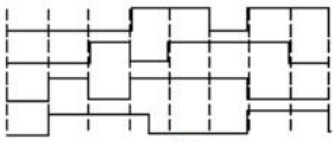
计算机网络课程第一次作业

1. 请描述下列计算机网络协议相关概念的含义：
   1） 计算机网络协议（Protocol）
   2） 协议实体（Protocol Entity）
   3） 服务原语（Service Primitives）
   4） 协议数据单元（PDU）
2. 请说明电路交换（Circuit-Switching，Circuit switched networks）与分组交换（Packet-Switching，Packet-switched networks）有什么不同？
3. 请说明 OSI-RM（开放系统互联-参考模型）中的物理层、数据链路层、网络层的功能。
4. 请说明物理层功能中的调制（Modulation）、复用（Multiplexing）的基本含义，并说明有哪些调制方法、有哪些复用方法。
5. 数据链路层的滑动窗口（Sliding Windows）协议中，发送窗口和接收窗口是怎样的含义？
6. 请说明下列 Linux 命令的功能：ping，netstat，ifconfig，ip, route，tcpdump，iptables。可以使用 Linux 的 man 命令（如 man ping, man ip 等等）查看这些命令的功能和使用方法。

46. A CDMA receiver gets the following chips: (−1 +1 −3 +1 −1 −3 +1 +1). Assuming the chip sequences defined in Fig. 2-28(a), which stations transmitted, and which bits did each one send?

A = (−1 −1 −1 +1 +1 −1 +1 +1)
B = (−1 −1 +1 −1 +1 +1 +1 −1)
C = (−1 +1 −1 +1 +1 +1 −1 −1)
D = (−1 +1 −1 −1 −1 −1 +1 −1)

(a)



(b)

$S_1 = C$ = (−1 +1 −1 +1 +1 +1 −1 −1)
$S_2 = B+C$ = (−2 0 0 0 +2 +2 0 −2)
$S_3 = A+\overline{B}$ = (0 0 −2 +2 0 −2 0 +2)
$S_4 = A+\overline{B}+C$ = (−1 +1 −3 +3 +1 −1 −1 +1)
$S_5 = A+B+C+D$ = (−4 0 −2 0 +2 0 +2 −2)
$S_6 = A+B+\overline{C}+D$ = (−2 −2 0 −2 0 −2 +4 0)

(c)

$S_1 \cdot C = [1+1-1+1+1+1-1-1]/8 = 1$
$S_2 \cdot C = [2+0+0+0+2+2+0+2]/8 = 1$
$S_3 \cdot C = [0+0+2+2+0-2+0-2]/8 = 0$
$S_4 \cdot C = [1+1+3+3+1-1+1-1]/8 = 1$
$S_5 \cdot C = [4+0+2+0+2+0-2+2]/8 = 1$
$S_6 \cdot C = [2-2+0-2+0-2-4+0]/8 = -1$

(d)

Figure 2-28. (a) Chip sequences for four stations. (b) Signals the sequences represent (c) Six examples of transmissions. (d) Recovery of station C's signal.

2. The following character encoding is used in a data link protocol:
A: 01000111 B: 11100011 FLAG: 01111110 ESC: 11100000
Show the bit sequence transmitted (in binary) for the four-character frame A B ESC FLAG when each of the following framing methods is used:

(a) Byte count.
(b) Flag bytes with byte stuffing.
(c) Starting and ending flag bytes with bit stuffing.

9. Sixteen-bit messages are transmitted using a Hamming code. How many check bits are needed to ensure that the receiver can detect and correct single-bit errors? Show the bit pattern transmitted for the message 1101001100110101. Assume that even parity is used in the Hamming code.

10. A 12-bit Hamming code whose hexadecimal value is 0xE4F arrives at a receiver. What was the original value in hexadecimal? Assume that not more than 1 bit is in error.

17. A bit stream 10011101 is transmitted using the standard CRC method described in the text. The generator polynomial is $x^3 + 1$. Show the actual bit string transmitted. Suppose that the third bit from the left is inverted during transmission. Show that this error is detected at the receiver's end. Give an example of bit errors in the bit string transmitted that will not be detected by the receiver.

27. The distance from earth to a distant planet is approximately 9×10^{10} m. What is the channel utilization if a stop-and-wait protocol is used for frame transmission on a 64 Mbps point-to-point link? Assume that the frame size is 32 KB and the speed of light is 3×10^8 m/s.