第四章作业如下：

4-1  A group of N stations share a 56-kbps pure ALOHA channel. Each station outputs a 1000-bit frame on average once every 100 sec, even if the previous one has not yet been sent (e.g., the stations can buffer outgoing frames). What is the maximum value of N?

答：纯ALOHA的带宽=0.184\*56kbps = 10.3kbps,每个站需要1000bit/100s=10bps，所以需要的站是10.3kbps / 10bps=1030个

4-2 Measurements of a slotted ALOHA channel with an infinite number of users show that 10% of the slots are idle.

(a) What is the channel load, G?

(b) What is the throughput?

(c) Is the channel underloaded or overloaded?

4-3  What is the baud rate of classic 10-Mbps Ethernet?

答：经典以太网使用曼彻斯特编码，每bit是2个信号周期。所以波特率是比特率的2倍，即20波特每秒。

4-4  Sketch the Manchester encoding on a classic Ethernet for the bit stream 0001110101.

答：信号使用2个值的方形波，高值（H）低值（L），从低到高跳变为0，从高到底跳变为1，所以是LHLHLHHLHLHLLHHLLHLH

4-5. A 1-km-long, 10-Mbps CSMA/CD LAN (not 802.3) has a propagation speed of 200m/u sec. Repeaters are not allowed in this system. Data frames are 256 bits long, including 32 bits of header, checksum, and other overhead. The first bit slot after a successful transmission is reserved for the receiver to capture the channel in order to send a 32-bit acknowledgement frame. What is the effective data rate, excluding overhead, assuming that there are no collisions?

答：一个完整的传输包括以下6个部分：

1. 发送者抓住线缆的时间10us（2\*1000米/(200米/微秒),竞争期是单向传播时间的2倍，过了竞争去才可以确认抓住了信道）
2. 数据发送时间为256bit/10Mbps=25.6us
3. 最后一位结束延迟时间5.0us,（单程传播延迟1000/(200米/微秒)）
4. 接收者抓住线缆时间10us,
5. ACK发送时间3.2us
6. 最后一位延迟时间5.0us

总时间为58.8us,所以有效数据率为（256-32）/58.8us=3.8Mbps

4-6  Consider  building a CSMA/CD network running at 1 Gbps over a 1-km cable with no repeaters. The signal speed in the cable is 200,000 km/sec. What is the minimum frame size?

答：竞争槽长度t=2τ=2\*s/v = 2 \* 1km/(200000km/s)=0.01ms

帧最小=1Gbps\*τ = 1Gbps\*0.01ms=10000b=1250B

4-7. Ethernet frames must be at least 64 bytes long to ensure that the transmitter is still going in the event of a collision at the far end of the cable. Fast Ethernet has the same 64-byte minimum frame size but can get the bits out ten times faster. How is it possible to maintain the same minimum frame size?

答：由题可知，B2=10B1 所以 t1 = 10t2 得τ1=10τ2

又v1=v2 所以s1=10s2，所以如果设置s2=10s1，可以维持同样的最小祯长度限制。

快速以太网的最大线缆延迟是以太网的1/10。

4-8. Suppose that an 11-Mbps 802.11b LAN is transmitting 64-byte frames back-to-back over a radio channel with a bit error rate of 10−7. How many frames per second will be damaged on average?

答：每祯包含512bit,bit错误率为10-7，所有祯都正确的概率是（1-107）512=0.999488，发生祯错误的概率是5\*10-5，每秒钟传输的祯数量是11\*106/512，约为21484帧，5\*10-5\*21484约为1，所以每秒钟大约有1帧损坏。

4-9. A switch designed for use with fast Ethernet has a backplane that can move 10 Gbps. How many frames/sec can it handle in the worst case?

答：最差的情况是无数的512bit长度的祯被发送，如果背板的速率是10Gbps,每秒可以处理109/512=1953125frame/s

4-10. Store-and-forward switches have an advantage over cut-through switches with respect to damaged frames. Explain what it is.

答：存储转发可以在转发之前先存储整个祯，等下一祯全部到来，去验证校验和，如果祯是损坏的，那么会立即被交换机丢弃。直通型的交换机损坏的祯不会被丢弃，因为祯错误被发现的时候，祯已经被转发出去了。