CS5310.0001/0002, Fall 2009
Computer Networks and Communication Systems
Assignment 2

Issued: 10/07/2009
Due: 10/21/2009

1. (20 pts) In class discussions it was pointed out that in asynchronous transmission mode a receiving DTE should have a receiving clock $R \times C$ that is N times faster than arriving data rate $R \times D$. We demonstrated through examples that this N should be at least 8 and ideally greater than or equal to 16. Student Jon Doe didn't agree with this. He said that he only needs a receiving clock that has the same frequency as the arriving data rate. He said with such a clock the receiver can just sample the arriving signal in the middle of each receiving clock cycle. Please point out why this argument is fault.

2. (15 pts) How do you understand the notion of link utilizations discussed in class? Is high link utilization good or not? **Please answer these questions with your own words**.

3. $(10 + 10 = 20$ pts)

Deduce the maximum theoretical information rate associated with the following transmission channels:

(a) Telex (international message switching) network with a bandwidth of 1000 Hz and a signal-to-noise ratio of 5 dB;

(b) Switched telephone network with a bandwidth of 3100 Hz and a signal-to-noise ratio of 10 dB.

4. $(15 + 15 = 30$ pts)

(1) Explain the 4-QAM constellation diagram in Fig.2.6(b), p.105. Can you draw a sample wave of modulated signals, i.e. draw a sequence of signals like the signal in Fig.2.6(a), p.105, that demonstrates the phase changes?

(2) Informally or formally Explain the 16-QAM constellation diagram in Fig.2.6(b), p.105.

5. (15 pts) What is modulation? Why is modulation needed? Do we need modulation in ISDN? How about PSDN?