EE 706: Communication Networks

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Spring 2011

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Quiz 1 : **15 points** February 4, 2011

WRITE THE CODE OF THE PAPER ON YOUR ANSWER SHEET. Explain your answers clearly for the last two questions. No points for guesswork.

1. (a) Place the following operations in the order that they occur at a receiver: Byte destuffing, Demodulation, FEC Decoding, CRC Decoding. [1 point]

   (b) Draw the differential Manchester waveform for the bit string 11100. Assume that the signal level to the left of the first bit in the string is low. [1 point]

   (c) Suppose a 100-byte frame consists of 2 FLAG bytes, 20 bytes of header, 70 bytes of payload and 8 bytes of CRC before byte-stuffing. What is the maximum length of the frame after byte-stuffing? [1 point]

   (d) State which network layer is responsible for each of the following tasks:

      i. Error-free communication between adjacent nodes
      ii. Routing
      iii. Modulation and demodulation
      iv. Equalization

   [1 point]

   (e) Show that $X^4 + X^3 + X^2 + X + 1$ is not a primitive polynomial. [1 point]

2. Suppose a CRC scheme uses the primitive generator polynomial $g(X) = X^5 + X^3 + 1$.

   (a) Generate CRC check bits for the information bits strings 1111 and 1010. In For both cases, write down the transmitted bit strings. [2 points]

   (b) What is the maximum rate of this CRC scheme such that all double bit errors are detected? [3 points]

3. Consider a source node sending information to a destination node over a noisy link which supports a data rate of B bits per second. Suppose that the source node uses a CRC code of rate R_1 and a FEC code of rate R_2. What is the maximum throughput achieved in this scenario? Explain your answer. [5 points]