EE3009 Data Communications & Networking
Test 2

27 April 2018
Duration: 45 minutes
Total Marks: 45

1. a. Give the codeword for the data bit sequence 0101100 encoded by the Single Parity Code.

   [1 mark]

   b. Assume that the codeword is transmitted through a channel with bit error rate p, write down an expression of the probability that two bits are corrupted.

   [2 marks]

   c. Write down an expression of the probability that the codeword contains undetectable errors.

   [2 marks]

2. A CRC is constructed to generate a 3-bit FCS for an 8 bit-message. The generator polynomial is $x^3 + 1$.

   a. Draw the shift register circuit that would perform this task.

   [3 marks]

   b. Encode the data bit sequence 10100001 using the generator polynomial and give the code word.

   [7 marks]

3. What is the advantage of Go-Back-N ARQ compared with Stop-and-Wait ARQ?

   [2 marks]

4. Two personal computers are connected by a 64 kb/s link and the one way propagation delay is 100 ms. The bit error rate of the link is 10^{-4}. Each frame contains 512 bytes, among which 4 bytes are overhead. Find the efficiency of Selective Repeat ARQ.

   $[\eta = (1 - \frac{n_0}{n_f})(1 - p_f)]$

   [4 marks]

5. Consider a star-topology network in which 25 terminals are attached by a dedicated pair of lines to a hub in a star topology. The distance from each terminal to the hub is 2500 meters, the speed of the transmission lines is 10 Mbps, all frames are of length 12,500 bytes, and the signal propagation on the line at a speed of 2.5×10^8 meters/second. The token ring protocol is used for medium access control. Assume single-frame operation and eight-bit latency at each station. Find the maximum throughput.

   [For single-frame operation, $\rho_{max} = \dfrac{1}{1 + \dfrac{\tau'}{X}(1 + \dfrac{1}{M})}$]

   [8 marks]