CSE 461 Homework 1
Due Friday October 8, 1999

1. The speed of light, and the speed of electricity through a copper wire, is 3.0 x 10^8 meters/second.
   (a) It's 2496 miles (4016 km) to Boston. If there's just one copper pair between seattle and boston, and I put a new bit on that wire every 10ns, how many bits have I sent before the first one reaches boston? (assume that the signal isn't attenuated beyond recognition)
   (b) The speed of light through glass is a little slower than the speed of light in a vacuum (and the speed of electricity in copper). The speed of light through glass is around 2.0 x 10^8 m/s. How long (in meters) is that 10ns bit?

2. HDLC denotes the beginning and end of a frame with the bit sequence 01111110. Use the HDLC bit stuffing rule to encode the following string (spaces are just for readability).

   0111 0100 1111 1011 1011 1111 0011

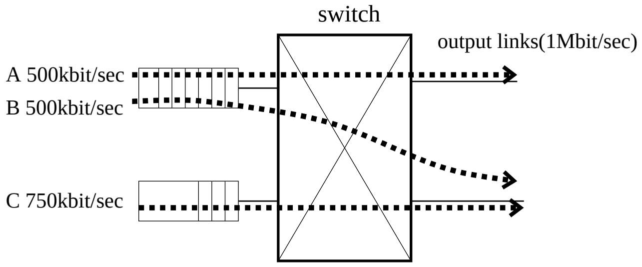
3. How many bits of error in a 4-bit word can the (7,4) Hamming Code presented in table 12.2 of the book
   (a) detect?
   (b) correct?

4. if the bit error rate on a link is 0.00001 (1×10^-5), what is the likelihood that a 576-byte frame will include an error?

5. Assume that a 6 port Banyan switch is constructed using 3x3 crossbars like those shown in figure 8.16 to implement each switching element.
   (a) Does it or a 6 port crossbar use fewer crossbar switches?
   (b) If they are both 16 ports?

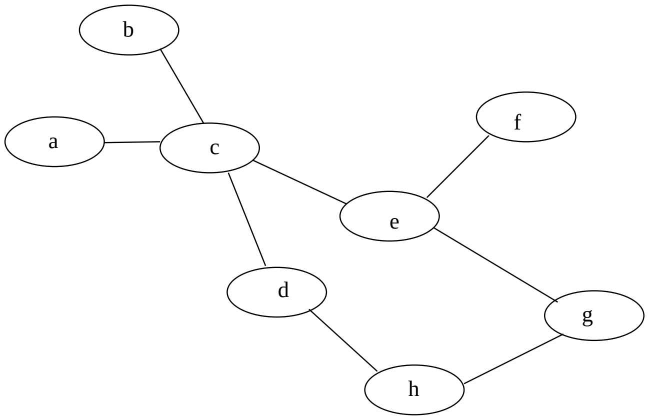
6. Assume a switch is implemented using only input queues. The switch has two input and two output ports, both of which run a 1Mbit/sec.

   The switch forwards three streams which enter it at fixed rates. Stream A runs at 500kbit/sec, arrives at the first input port, and is forwarded to the first output port. Stream B also runs at 500kbit/sec and is forwarded to the second output port. Stream C runs at 750kbit/sec as is also forwarded to the second output port.

   Please give a short, qualitative description of the performance of stream A as it leaves the switch.

7. For the following network, assume that the nodes are numbered hierarchically in such a way as to minimize the overall number of forwarding table entries. For each node, state the number of entries required.



Node	Number of Entries
a	
b	
c	
d	
e	
f	
g	
h	