**Worksheet 15**

1. If all the links in the Internet were to provide reliable delivery service, would the TCP reliable delivery service be redundant? Why or why not?

Not redundant.

In the link the data could be fine, but in the router it could get lost in a queue and dropped. TCP would provided a backup for reliable delivery.

TCP guarantees also that packets will be in order.

Although all the links guarantee error-free operation, it is not guaranteed that IP datagrams will arrive at the destination host in the proper order. With IP, datagrams in the same TCP connection can take different routes in the network, and therefore arrive out of order. TCP is still needed to provide the receiving end of the application the byte stream in the correct order. Also, IP can lose packets due to routing loops or equipment failures.

2. What are some of the possible services that a link-layer protocol can offer to the network layer? Which of these link-layer services have corresponding services in IP? In TCP?

Framing, Link access: IP: Yes , TCP: Yes

Reliable delivery between nodes: IP: No , TCP: Yes

Flow Control: IP: No , TCP: Yes

Error Detection: IP: yes , TCP: Yes

Error Correction: both no

Half-Duplex: No both

Full Duplex: IP: no , TCP: Yes

3. True or False:

a. Single-bit parity checks can detect and correct a single bit error.

False. (detect but not correct)

b. Single-bit parity checks can detect even number of bit errors.

False.

c. Two-dimensional parity checks can detect and correct a single bit error.

True.

d. Two-dimensional parity checks can detect and correct a double-bit error.

False.

e. Two-dimensional parity checks can detect but cannot correct a double-bit error.

True.

4. Consider the 4-bit generator, G=1001, and suppose that D has the value 101110. What is the value of R? Show your work. 

\*\*\* Same as CRC example in lecture.

Try to solve without looking at example

G \_\_\_\_ 1 0 1 0 1 1

1001 / 1 0 1 1 1 0 0 0 0

1 0 0 1

0 0 1 0 1

0 0 0

1 0 1 0

1 0 0 1

0 0 1 1 0

0 0 0

1 1 0 0

1 0 0 1

0 1 0 1 0

1 0 0 1

0 0 1 1 = R