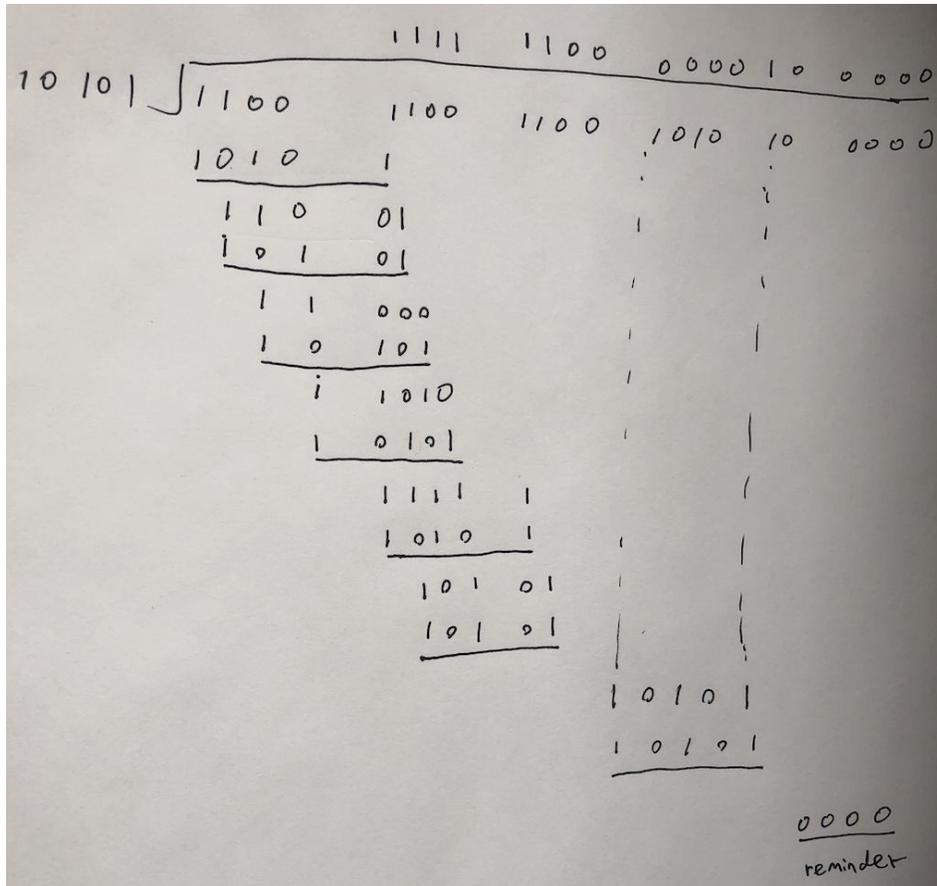CSci 4211
Homework 5 Solution
Due May 1, 2019

1. solution:
    a. non-persistent
        i.   if idle, transmit
        ii.   if busy, wait random amount of time
    b. 1-persistent
        i.   If idle, transmit with probability 1
        ii. If busy, wait till it becomes idle
        iii. If collision, wait random amount of time
    c. In 1-persistent CSMA, station will sense the channel after a collision. Then, it will send if it is become idle. However, non-persistent will always wait random time if it is busy. Thus, in light traffic load, the 1-persistent will outperform than non-persistent.

2. solution:
    a. The generator could be derived from the function as 10101, thus the R(enminder) should equal to 4.
    b. As calculation shown in following figure, R is 0000.

```
                    1 1 1 1      1 1 0 0     0 0 0 0 1 0    0 0 0 0
  1 0  1 0 1 ⟌1 1 0 0          1 1 0 0     1 1 0 0   1 0 1 0    1 0     0 0 0 0
              1 0 1 0      1
              ─────────
              1 1 0    0 1
              1 0 1    0 1
              ─────────
                1 1    0 0 0
                1 0    1 0 1
                ─────────
                  1    1 0 1 0
                  1    0 1 0 1
                  ─────────
                   1 1 1 1    1
                   1 0 1 0    1
                   ─────────
                     1 0 1    0 1
                     1 0 1    0 1
                     ─────────
                           1 0 1 0 1
                           1 0 1 0 1
                           ─────────
                               0 0 0 0
                               reminder
```

c. Thus, by attaching the R to the original message, the string of bits is
    110011001100101010000

3. solution:
    a. Token passing protocol have better performance than CSMA/CD when the
        channel is busy.
    b. In token passing protocol, only one host with the token can transmit data.
        However, in CSMA/CD, the host will stop while the collision happens. Thus, if the
        channel is busy, collision happens frequently. Thus, the token passing protocol
        will be more efficient.

4. solution:
    a. Token Ring frames have two fields that control priority: the priority field and the
        reservation field.
    b. Token carries priority bits: Only stations with frames of equal or higher priority
        can grab the token.

      c. station can make reservation: When a data frame goes by if a higher priority has not been reserved.

5. When Ethernet speed increases, CSMA/CD becomes worse because it needs larger packet size to detect collision. New technologies such as Carrier Extension and Packet Bursting are adopted. .
http://www.cs.wustl.edu/~jain/cis788-97/ftp/gigabit_ethernet/#Cab

Another direction is to avoid collisions, so that we do not need to use CSMA/CD. We adopt full duplex mode in Ethernet. Full-duplex mode can be applied to point-to-point Ethernet connection and Fast Ethernet connection, because they use different lines of twisted pair cable, there will be no collision.