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CS 118
DIS 1A

Homework 4

1.

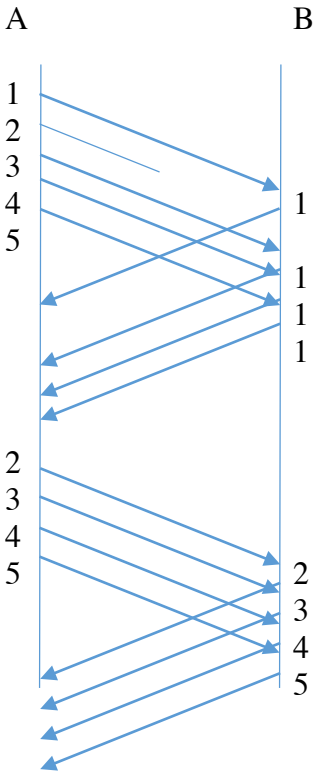
a. sequence number = 80 + 127 = 207, source port number = 302, destination port number = 80

b. acknowledgement number = 207, source port number = 80, destination port number = 302

c. acknowledgement number = 127

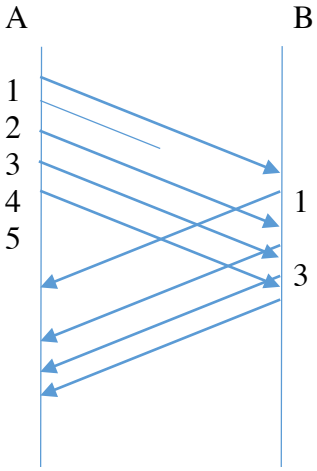
2.

a. Go-Back-N



A sends 9 segments, B sends 8 ACKs

Selective Repeat



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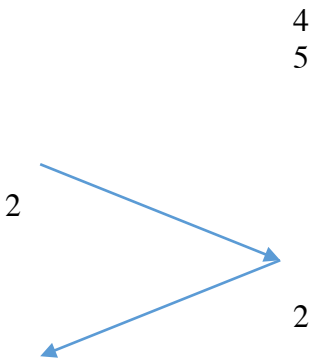
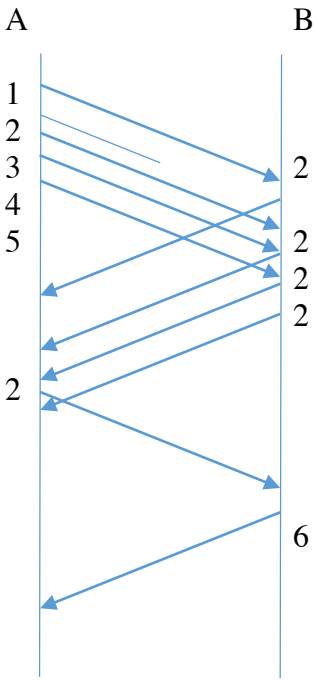


A sends 6 segments, B sends 5 ACKs

TCP



A sends 6 segments, B sends 5 ACKs

b. TCP will delivery all five data segments the fastest due to its fast retransmission feature.

3.

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a. Sequence numbers reflect how much data is sent. So the maximum file size is 2^{32} bytes (32 bit wide packet)

b.

$$\frac{2^{32}\ bytes}{536\ bytes} = 8{,}012{,}999\ segments\ to\ send$$

$$(8012999\ segments) * \left(54\frac{bytes}{header}\right) = 432{,}701{,}946\ bytes\ for\ overhead$$

$$total\ bytes\ to\ send = 2^{32} + 432701946 = 4{,}727{,}669{,}242\ bytes$$

$$(4727669242\ bytes) * \left(8\frac{bits}{byte}\right) = 37{,}821{,}353{,}926\ bits\ to\ send$$

$$\frac{37821353926\ bits}{150000000\ bps} = 252.143\ seconds$$

4.

a. If the receiver is expecting k, then the receiver must have sent ACKs for k-3, k-2, k-1. If the sender received those ACKs, the sender's window would be k, k+1, k+2. If the sender didn't receive those ACKs, the sender's window would be k-3, k-2, k-1. So the sender's window is the range from k-3 to k+2 at intervals of 1.

b. Only k-3, k-2, k-1. If the receiver is expecting k and the window size is 3, those are the only 3 that could possibly be in transit.