Problem 1:

a. normal data segment
b. request termination of the connection
c. ack the last segment received + request termination of the connection
d. request to reset the connection
e. this is a synchronization segment for establishing a TCP connection
f. acknowledge the previous synchronization segment + synchronization for connection

Problem 2:

Segment 1: from Sender -> Receiver
SEQ# = 14534, SYN=1, ACK=0
Segment 2: from Receiver -> Sender
SEQ#=21732, SYN=1, ACK=1, ACK#=14535
Segment 3: from Sender -> Receiver
SEQ#=14535, SYN=0, ACK=1, ACK#=21733

Problem 3:

Total number of SEQ#'s SEQ_MAX = 2^{32} – 1 = 4,294,967,295

Available SEQ#s from 7000 to SEQ_MAX = SEQ_MAX – 7000

Time needed to exhaust this space with 1 mega-byte per second bandwidth:

(SEQ_MAX-7000) / 1000000 = 4295 seconds

Problem 4:

Before receiving ack 22001:
The window can start from 22000 or lower with size 10000 bytes

After receiving ack 22001:
The window shifts to 24000-34000, which means the sender can send up to byte 34000 without an acknowledgement.

Problem 5:

Header_size = 20 bytes, useful_data_size = 16 bytes.
Efficiency at TCP level = data_size / total_segment_size = 16 / (20+16) = 44.4%