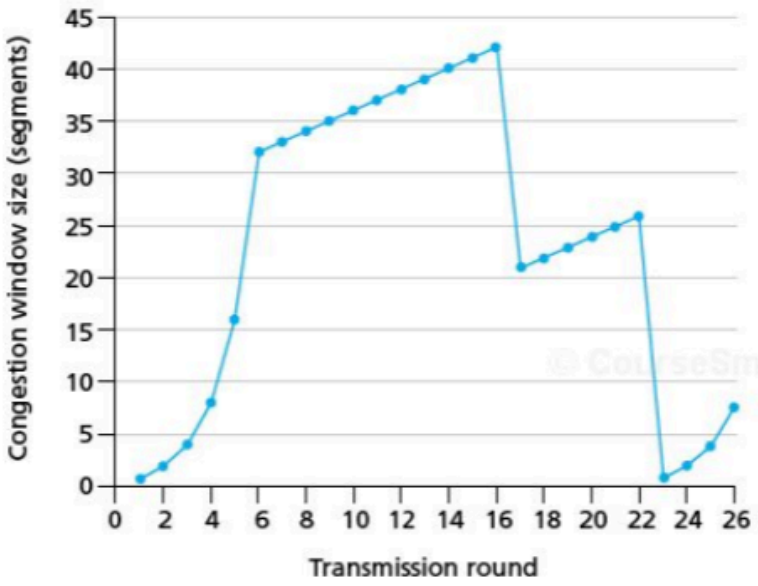
1. (50 points) Consider a TCP sender that runs the TCP Reno congestion control scheme. Suppose this TCP sender is experiencing the behavior shown in the "**Transmission Round vs. Congestion Window Size**" figure below. Initially, ***cwnd = 1***. Answer each of the following questions and provide a short discussion to justify your answer.



a) From rounds 1-7 and 23-26
b) From rounds 7-16 and 17-22
c) 33, the value at which it switches from slow start to congestion avoidance
d) 33, ssthresh only gets calculated when there is congestion detected
e) 21, the value that the graph drops to
f) 12, floor(cwnd/2)
g) 3rd ACK, this is because it is still in congestion avoidance mode after the drop
h) RTO, this is because it is now in slow start mode
i) 11th transmission
j) new_ssthresh = floor(cwnd/2) = 8/2 = 4
new_cwnd = floor(cwnd/2) = 4

Time	Packets Received	Action Taken	List of unACKs packets	Total # dup ACKs	Estimated # outstanding packets	ssthresh value	cwnd size	cwnd range	# new packets to send
4 RTT	A9		9, 10, 11, 12			4	5 + 1/5	9,10,11, 12,13	1: #13
	A10		10,11,12, 13			4	5+2/5	10,11,12, 13,14	1: #14 14 lost
	A11		11,12,13, 14			4	5+3/5	11,12,13, 14,15	1: #15
	A12		13,14,15,			4	5+4/5	12,13,14,	1: #16

			16					15,16	
	A13		13,14,15, 16			4	6	13,14,15, 16,17,18	2: #17, #18 18 lost
5 RTT	A14								
	A14								
	A14								
	A14	C.D. restrainmi t 14	14,15,16, 17,18	3	5-3 = 2	3	3	14,15,16	1: 19
6 RTT	A18	Partial ACK retransmi t 18	17,18,19	0	3-0 = 3	3	3	17,18,19, 20	0
	A18		17,18,19	1	3-1 = 2	3	3	17,18,19, 20	1: 20
7 RTT	A20	Exit F.R.	20			3	3 1/3	20,21,22	2: 21, 22
	A21		21, 22			3	3 2/3	21,22,23	1: 23