**SPRING 2021 MIDTERM EXAM I CS:352**

1. **Performance**

Consider the scenario shown In the figure in which a server is connected to a router by a 100 Mbps link with a 50 msec propagation delay. This router is connected to two downstream routers over a 50 Mbps link with 200 msec propagation delay. A 1 Gbps link with 0 propagation delay connects a host and a cache to each of these routers. All packets are 20,000 bits long

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1. What is the total time taken from when a packet is transmitted by the server to when it is received by the client?

**Transfer time (Packetsize/BW)= 200 + 400 + 20 microsec**

**Propagation delay = 50 + 200 + 0 = 250 msec**

**Total time 250 + 0.62 msec = 250.62 msec**

1. What is the maximum rate at which the server can deliver data to a single client if we assume no other clients are making requests

**Bottleneck BW= 50 Mbps**

1. Assume that the client has a HTTP cache and 65% of the request can be satisfied by a local cache. What is the average rate at which the client can receive the data in this case?

**.65 (1Gbps) + .35(50 Mbps) = 667.5 Mbps**

1. If both clients are active and make requests to the server, what is the average rate at which each client can receive the data?

**Shared link B/W = 100 mbps , so shared B/W is 100/2 = 50 mbps, different bottleneck links of 50 Mbps. Hence B/W= 50 Mbps**

**TCP (20 points)**

A TCP connection has a flow control window of 40 packets and a minimum congestion window of 2 packets. How many RTTs are required to send 25 packets (with sequence number 1 through 25), assume no packet loss under the following conditions:

21. No slow start

**Up to FC window: 25 packets , 1 RTT**

22. With slow start but no linear phase

**Min CW=2, 4, 8, 11 4 RTT**

23. With slow start and SS\_THRESHOLD =8 packets

**Min CW=2, 4, 8, 9, 2 5 RTT**

24. With slow start and SS-Threshold=4 packets

**Mon CW=2, 4,5,6,7,1 6 RTT**