PK

Q1. Suppose a client machine A is communicating with a data center B located 10000 km away from A. How long will it take for a request to reach to the server B? (Assume speed of light in cable is 2e8 m/s).

$$Distance = speed * time$$

$$time = \frac{distance}{2*10^8} = \frac{1000 * 10^3}{2*10^8} = 0.05\ sec = 50\ msec$$

$$\text{the total time take request and response} = round\ time = 2 * 50 = 100\ msec$$

$$T_{RT} = T_{req} + T_{res} + \sum delay$$

Q2. Suppose a client machine C is communicating with a data center D located 12000 km away from C. Assume that the TCP connection has been established and is kept alive. If each new request can be sent only after receiving an acknowledgement from D for the previous request, then what is the maximum number of requests that can be sent from C to D in one second? (Assume speed of light in cable is 2e8 m/s).

$$Distance = speed * time$$

$$time = \frac{distance}{2*10^8} = \frac{12000 * 10^3}{2*10^8} = 0.06\ sec = 60\ msec$$

$$\text{the total time take request and response} = round\ time = 2 * 60 = 120\ msec$$

$$max\ request\ per\ second = \frac{1000}{120} = 8$$

- Stateless Protocol .
- Stateful Protocol .

Q3. For a network bandwidth of 10 Gbps, what should be the size of each request if 5000 such requests are to be sent over the network per second? [Use: 1 KB = 1000 Bytes, 1 MB = 1000 KBs and so on.]

$$= \frac{10^{10}}{5000} = 2*10^6\ mb = \frac{2*10^6}{8} = 0.25\ MB$$

$$bandwidth = \frac{Data}{sec}$$

$$Bandwidth = size * noof\ requestper\ sec$$

Q4. A mobile server and a client initially 750 km apart are moving towards each other in a straight line with the speeds of 165 mph and 85 kmph respectively. The network bandwidth is set constant to 2 Mbps. Determine how much data (in Gigabytes) is used by the client before the client and the server collide. [speed of light in vacuum: 3 x 10^8 m/sec, 1 MB = 1000 KB and so on.]

$$D = bandwith * time$$

$$t_{used} = \frac{distance}{speed\ of\ client + speed\ of\ server} = \frac{750}{85+165} = 3\ hrs$$

$$D = 2* 10^6 * 3* 60* 60 = 216 * 10^8\ bits = 216\ Gb = 2.7\ GB$$

Q5. A certain video on the web occupies 2 megabytes of memory of the server. If there are 5 million concurrent viewers of that video assuming that each viewer requires an individual connection to the server to view the video, what should be the minimum RAM requirement of the server that can process requests from all the viewers simultaneously?

$$= 5 * 10^6 * 2 * 10^6$$
$$= 10\ TB$$