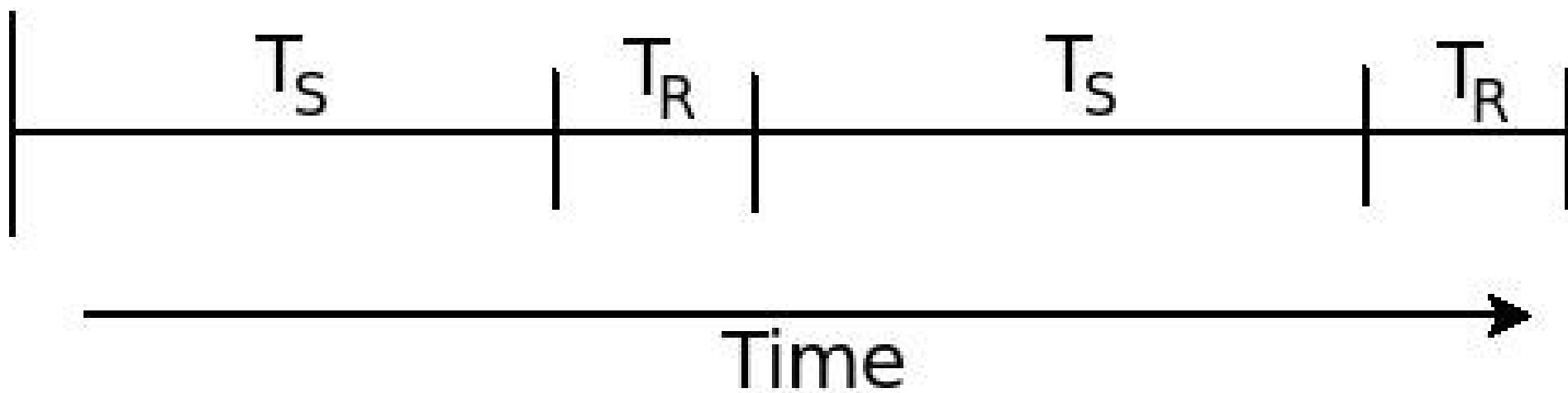**Problem 1:**

One way propagation delay= P seconds, bandwidth = B bits/sec.

The link is shared using TDM.
 Assume that sender sends data in packets of size F bits and receiver sends ACK in packets of size A bits.

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- Suppose you are implementing the stop and wait protocol.

- What is sender timeout for retransmission?

- Assuming no packet loss, what is the link efficiency of this system ?
  Hint: Find out how many bits of application layer data are you able to get across from sender to receiver per second.

- Let us implement sliding window on this. If the sender window size is limited to X frames, how would you set T_S and T_R to get maximum link efficiency? What is the resulting link efficiency? (Assume no packet loss).

Problem 2 :

- Consider a router with a switch fabric, 2 input ports (A and B) and 2 output ports (C and D). Suppose the switch fabric operates at 1.5 times the line speed.

- **a.** If, all packets from A are destined to D, and all packets from B are destined to C, can a switch fabric be designed so that there is no input port queueing ?

- **b.** Suppose now packets from A and B are randomly destined to both C and D. Can a switch fabric be designed so that there is no input port queueing?

- **Problem 3:**

- Suppose datagrams are limited to 1500 bytes (including header) between source Host A and destination Host B. Assuming a 20 byte IP header and a 20 byte TCP header, how many datagrams would be required to send an MP3 file consisting of 4 million bytes?

- **Problem 4:**

- Suppose the IEEE 802.11 RTS and CTS frames were as long as the standard DATA and ACK frames. Would there be any advantage to using the CTS and RTS frames? Why or why not?

- **Problem 5:**

- Suppose you wanted to do a transaction from a remote client to a server as fast as possible. What will you use- TCP or UDP? Why?

- **Problem 6:** True or false?

- Suppose Host A is sending Host B a large file over a TCP connection. The number of unacknowledged bytes that A sends cannot exceed the size of the receive buffer.

- **Problem 7:**

- Is the size of TCP RCVWindow static or dynamic throughout the connection?