

**Computer Networks**  
**2<sup>nd</sup> Year, 1<sup>st</sup> Semester**

**Tutorial 8 - TCP**

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1. IP is responsible for \_\_\_\_\_ communication while TCP is responsible for \_\_\_\_\_ communication.
  - a) host-to-host; process-to-process
  - b) process-to-process; Host-to-host
  - c) process-to-process; network-to-network
  - d) network-to-network; process-to-process
2. A host can be identified by \_\_\_\_\_ while a program can be identified by \_\_\_\_\_.
  - a) An IP address; a port number
  - b) A port number; an IP address
  - c) An IP address; a host address
  - d) An IP address; a well-known port
3. The \_\_\_\_\_ address **uniquely** identifies a running application program.
  - a) IP address
  - b) Host
  - c) NIC
  - d) Socket
4. A TCP client opens a connection with a server using an initial sequence number (ISN) of 14534. The server opens the connection with an ISN of 21732. Show the three TCP segments during the connection establishment. State the sequence number and the acknowledgement number as well.
5. Following the previous exercise, show how the following segments are sent by the client and the server. State the sequence number and the acknowledgement number.

| Client     | Server     |
|------------|------------|
| 1200 Bytes |            |
| 1000 Bytes |            |
|            | 2000 Bytes |
|            | 2500 Bytes |
| 100 Bytes  |            |
6. Following the previous exercise, show the segments transferred during the connection termination. State the sequence number and the acknowledgement number as well.
7. Following the previous exercise, assuming that the server is a Telnet server, show the entries for the header of the 'FIN' TCP segment that is transmitted from the client. Length of the TCP header is 32 Bytes. Fill the checksum field with 0s.
8. Is 'piggybacking' used in any of the segments transferred in question no.7, 8 or 9? Write the sequence numbers of the segments where piggybacking is used.

9. Which two fields are necessary to indicate that the data in a particular segment is urgent?
10. Describe the Retransmission timer and the Keepalive timer.
11. TCP sends a segment at 5:30:20. It receives the acknowledgement at 5:30:25. What is the new value for RTT if the previous RTT was 4 seconds?
12. A client uses, TCP to send data to a server. The data is 16 Bytes. Calculate the efficiency of transmission at the data link layer (ratio of useful bytes to total bytes). Assume no options for the IP header and use Ethernet at the data link layer.
13. A TCP connection is using a window size of 10000 bytes and the previous acknowledgement number was 22001. It receives a segment with acknowledge number 24001. Draw a diagram including the window size.
14. What timer is used to handle the zero window-size advertisement? Explain.
15. Give an example to show how TCP overcomes the problems with corrupted segments, out-of-order segments and duplicate segments.
16. Show how a client process goes through the different states as it establishes a connection with a server and exchanges data from the start point.
17. Show how a server process goes through the different states as it establishes a connection with a client and exchanges data from the start point.
18. Show how a client process goes through the different states as it terminates the connection with a server.
19. Show how a server process goes through the different states as it terminates the connection with a client.