Instructions:

I. *You must submit your homework electronically only in .pdf format. All word processed, no handwriting.*
II. *Submit your homework via Canvas no later than 11:59 pm Sep 21, 2022.*
III. *Late homework is subject to 10% penalty for each day past the due date, and before the solutions are posted. No homework will be accepted after the solutions are posted.*
IV. *Students can discuss problems and share their ideas among themselves but MUST work out the homework problems individually. Any deviation from this policy may result in an" F" grade for the course.*
V. *You must start working on these problems immediately. Otherwise, you may not have enough time to submit them on time.*

---

1. Which OSI layer is associated with IP addressing?

    a. 1
    b. 2
    c. 3
    d. 4

2. Which type of addressing is found at the OSI layer 2?

    a. Logical
    b. Physical
    c. MAC
    d. IP
    e. Port

3. When a server responds to a web request, what occurs next in the encapsulation process after the web page is formatted and separated into TCP segments?

    a. The client decapsulates the segment and opens the web page.

    b. The client adds the appropriate physical addresses to the segments so the server can forward the data.

    c. The server converts the data to bits for transport across the medium.

    d. The server adds the source and destination IP address to each segment header to deliver the packets to the destination

    e. The server adds the source and destination physical addresses to the packet header.

4. Which term describes a specific set of rules that determines the formatting of messages and the process of encapsulation used to forward data?

    a. Segmentation b. Protocol

    c. Multiplexing d. QoS

    e. Reassembly

5. Which two are protocols associated with layer 4 of the OSI model?

   a. IP b. TCP c. FTP d. TFTP e. UDP

6. Briefly describe following terms:

   6.1. Multiplexing

   6.2. PDU

   6.3. Protocol

   6.4. Encapsulation

   6.5. Segmentation

7. A factor in the delay of a store-and-forward packet-switching system is how long it takes to store and forward a packet through a switch. If switching time is 10 μsec, is this likely to be a major factor in the response of a client-server system where the client is in New York and the server is in California? Assume the propagation speed in copper and fiber to be 2/3 the speed of light in vacuum (2×10^8 m/s).

8. A client-server system uses a satellite network, with the satellite at a height of 40,000 km. What is the best-case delay in response to a request?

9. Two networks each provide reliable connection-oriented service. One of them offers a reliable byte stream and the other offers a reliable message stream. Are these identical? If so, why is the distinction made? If not, give an example of how they differ.

10. A system has an n-layer protocol hierarchy. Applications generate messages of length M bytes. At each of the layers, an h-byte header is added. What fraction of the network bandwidth is filled with headers?

11. An image is 1024 x 768 pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it over a 56-kbps modem channel? Over a 1-Mbps cable modem? Over a 10-Mbps Ethernet? Over 100-Mbps Ethernet?