B38CN: Introduction Communications and Networks
Tutorial 1 (Chapter 1) – Solutions

1. 1) Using layered protocols breaks up the network design problem into smaller, more manageable pieces. Layering means that protocols can be changed without affecting higher or lower ones.
   2) No. In the OSI protocol model, physical communication takes place only in the lowest layer, not in every layer.
2. Connection-oriented communication has three phases. In the establishment phase a request is made to set up a connection. Only after this phase has been successfully completed can the data transfer phase be started and data transported. Then comes the release phase. Connectionless communication does not have these phases. It just sends the data.
3. Message and byte streams are different. In a message stream, the network keeps track of message boundaries. In a byte stream, it does not. For example, suppose a process writes 1024 bytes to a connection and then a little later writes another 1024 bytes. The receiver then does a read for 2048 bytes. With a message stream, the receiver will get two messages, of 1024 bytes each. With a byte stream, the message boundaries do not count and the receiver will get the full 2048 bytes as a single unit. The fact that there were originally two distinct messages is lost.
4. The service shown is the service offered by layer k to layer k+1. Another service that must be present is below layer k, namely, the service offered to layer k by the underlying layer k−1.
5. (1) Data link layer. (2) Network layer.
6. Frames encapsulate packets. When a packet arrives at the data link layer, the entire thing is used as the payload field of a frame. Besides the payload field for holding the packet, each frame also contains a frame header and a frame trailer. The entire packet is put in an envelope (the frame).
7. Both models are based on layered protocols. Both have a network, transport, and application layer. In both models, the layers up through and including the transport layer are end-to-end. On the other hand, they differ in several ways. The number of layers is different, the TCP/IP does not have session or presentation layers, and OSI has both connection-oriented and connectionless service in the network layer.
8. TCP is a reliable connection-oriented protocol, whereas UDP is an unreliable connectionless protocol.
9. Small, fixed-length cells can be routed through switches at high speed, and completely in hardware. Small, fixed-size cells also make it easier to build hardware that handles many cells in parallel. Also, they do not block transmission lines for very long, making it easier to provide quality-of-service guarantees.