- Q1.1:
  - Application layer: Protocols at the top level of the stack specify how applications are to interact when they communicate.
  - Transport layer: Protocols in the Transport layer provide for communication from an application program on one computer to an application program on another.
  - Network layer- The Internet layer (referred to as Internet Protocol or IP) specifies how two computers communicate across a network.
- Q1.2:
  - The channel bandwidth is the fastest continuously oscillating signal that can be sent over the channel. It is measured in cycles per second or Hertz (hz). The baud rate is a measure of how the communications method actually uses the channel bandwidth. Therefore, the baud rate is the transmitter's maximum signal rate. The baud rate will be at most the channel bandwidth.
- Q1.3:
  - The Nyquist theorem provides the best case theoretic data rate over a channel of a given bandwidth when used with a particular modulation method.
  - Data rate: 2 B logK = 2 * 10Mhz * log k where k is the number of signal levels. (64 in this case).
    - D = 20,000,000 * 6 = 120 Mbps
  - The theoretic data rate needs to be adjusted to account for overhead. For this example, the maximum usable data rate is 27 Mbps.
- Q1.4:
  - While higher order modulations offer higher data rates, they become more sensitive to noise and channel impairments. CV applications generally do not send lots of data and do not need high data rates. Reliability, quantified by packet loss rates and robust connectivity over longer distances, is much more important.
- Q1.5:
  - For a link such as an Ethernet, data in octets are sent serially starting with the most significant bit.
  - For an Ethernet, the sign bit is sent first.
- Q1.6:
  - A circuit-switched network can guarantee a certain amount of end-to-end bandwidth for the duration of a call. Most packet-switched networks today (including the Internet) cannot make any end-to-end guarantees for bandwidth. FDM requires sophisticated analog hardware to shift signal into appropriate frequency bands.
- Q1.7:
  - a) 2 users can be supported because each user requires half of the link bandwidth.
  - b) Since each user requires 1Mbps when transmitting, if two or fewer users transmit simultaneously, a maximum of 2Mbps will be required. Since the available bandwidth of the shared link is 2Mbps, there will be no queuing delay before the link. Whereas, if three users transmit simultaneously, the bandwidth required will be 3Mbps which is more than the available bandwidth of the shared link. In this case, there will be queuing delay before the link.
  - c) Probability that a given user is transmitting = 0.2
  - d) Different ways to do this. Easiest is to define three events (E1, E2, E3) to represent a user transmitting. The P[Ei] is 0.2. Define an event E that represents when all three users are transmitting. So the Event E is equivalent to E1&E2&E3. P[E]=P[E1]P[E2]P[E3] which is 0.2*0.2*0.2 = 0.008

- Did not get a chance to complete the rest of these questions but I plan to study the solution very closely and practice for the exam.