Answer #1

1. The division of communication into layers has a major benefit. The layers divide the process into tasks that could be worked on and improved separately. It allows for a changes to be made in one layer and not have to make changes in another layer.

The picture shown describes how the layer functions from sender to receiver. When layer n from sender deals with a certain aspect layer n in receiver deals with that same aspect. Except that layer n – sender adds the information of that layer. And layer n – receiver removes that information. (if it’s the intended receiver and that also depends on the layer discussed. A receiver might remove a layer stop removing layers add a layer and transmit to the next receiver.)

2. Addresses are needed if you want to be able to have a network with more then two devices are trying to communicate. For example, if you are in a room with one other person you would not need to do the handshake and call their name. wait to get a response to make sure he/she knows you are talking to them. If you are in a room with multiple people you would need to do so or they wouldn’t know you are talking to them. Having addresses also opens the door to multiplexing where you are able to send to more then one person at the same time. Different messages using the same line.

Error control is always needed. In any given line there could be a lot of noise. Whether it be a lightning hit the wire or wind disturbed the frequency. The message might be full of errors. And the message intended might be flawed. Or might be sent to the wrong person. There are many ways to detect errors mostly mathematical. You could use hamming where the or have a counter or send the same message three times to compare the messages to each other and see if there is any mistake(this method could be very wasteful). A parity bit could be very useful. And a mix of everything together could be a super error detection correction model. Obviously if lightning hit a wire transporting information the information would be quite corrupted and layer 2 would just need to throw it away.

Flow control is needed for any line because if you send information to fast for the layer underneath it. The information will get congested and won’t make through. Or we might get some major errors.

Circuit switching vs. packet switching – a good way to think about this is a phone call vs. an email. With a phone call you would use circuit swithching. you need the information to go as quickly as possible from source to destination so that you may carry a conversation. If bits and pieces get lost you don’t want the phone to replay it for you and interfere with the conversation. Or have to wait for the other persons side of the conversation to be put together and given to you. You want to get it as is as quickly as possible. An email on the other hand you want to be able to read from beginning to end with out any errors. And you don’t care if takes an extra second or even a few seconds for the email to reach you. So for an email you will use packet switching where packets will be send , and not care how they get there, they might take different routes and get to the destination in a different order then they were sent, but at the end the packets will be put together and you will be able to read your received email.

Connection oriented vs. connectionless - Both can be used by circuit switching and packet switching. The main difference is, connection oriented sender will wait for the other side to send acknowledgments and connectionless won’t. If you want to send a packet and make sure the receiver got it, you will use connection oriented, if you don’t care as much you would use connectionless. Naturally with a phone call once you connect you do not wait for the receiver to tell you he received you just keep sending information.

3. Error correction and detection is required in both the link layer and the transport layer. And they serve a slightly different purpose. And will proceed a bit differently about what to do. In the link layer an error will be detected usually because some type of noise on the line. And if the error could be corrected it will correct it and move on as you would expect. If the error cannot be corrected it will simply throw away the packet and move on.

In the transport layer, packet corruption will also be looked for, errors that the link layer may have missed. And if something went wrong it will ask for a retransmission. It also more mainly checks if all the packets arrived and puts them together and if a packet is missing it will ask the sender to resend it.

4.) Data Plane – is the part of the network that forwards user traffic, So it is responsible for getting data from sender to receiver. Sometimes it’s called the forwarding plane, which simply describes what the responsibility is. part of that responsibility is what to do with data when it arrives. Does it send it further? To where? How much? How?

Control plane – is responsible for setting up connection, stopping a connection, making sure connection is running and has routes for the data to get from place to place.

Management plane – configures monitors and provides management. The management plane will remember IP’s and configure the device to send to the correct IP.

The only one that could function somewhat without the others is the Data Plane, although without the other two you wouldn’t be able to do much. Control plane comes “on top” of the data plane.

A router will have all three protocols to be able to forward information to the right destinations.

The Only time we have less then the 3 protocols is if the network is really small. And everything would be broadcasted. Each of the planes work separately and affect all layers in the layered environment.

5. NMS (Network Management System) is software used to check if a network is having issues. It will send a message to the owner. Such as a text message to let him know that it stopped working. The purpose is having a monitoring system on a network. If this network is responsible for security, the owner will most certainly want to know if his network is down.

6.) The unit that is completely relative is the (db) decibel. Bel is a unit that that was formulated to be able to compare sound. Formula= once you calculate this formula you formed a Bel. Now when you add a Bel you make the sound seem twice as loud. According to this formula the power must increase 10 times to double the loudness. This is because the human ear has a logarithmic sensitivity. A Decibel is a finer measurement for engineers. 1db=0.1Bel. So to double loudness now with our new measurement you must add 10 db to double. Doubling the sound is completely relative!!! The amount started from is the db. That we created by the above formula.

7.) Indicate what advantage is there in a signal representing digital information that a signal representing analog information does not have? And explain your answer.

A) The signal strength can be increased with an amplifier

B) Bad SNR can be fixed with a relay (Repeater)

C) Information can be transmitted by modulating a carrier wave

D) Multiple signals can be multiplexed on the same line

E) Signals can be switched from line to line

8.) How many logical levels should a signal detect in order to transmit n bits in each symbol in serial communication?

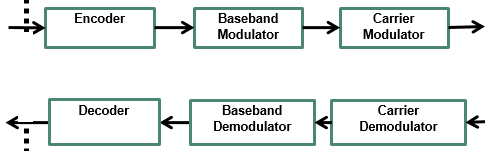
1. log2 n
2. n
3. n2
4. 2n
5. 2n

9.) Explain, describe and detail the following terms:

* Amplitude: The distance from the center line from to the top and to the bottom.
* Frequency: How many times a wave point in the wave hits per given time ratio.
* Phase: Where does the wave start it could start form the top or bottom or anywhere in between.
* Spectrum: A certain frequency amplitude or bandwidth being used for communication can be referred as a spectrum. Ex: A spectrum can be sold to a company to be used for transmission.
* Bandwidth: Is a measurement of space between two given points of a transmission. Where you would expect to find the wave in the same spot

Transmission rate: How many bits per second can you transmit over a certain transmission with a certain distance and noise to signal ratio.

10.) SNR represents signal to noise ratio. The affect is how much data you could transfer per unit of time. When you have noise, it disrupts the signal and creates errors. And reduces the transmission. The noise could be anything. Other traffic… The impairments could be avoided if the signal is unique and or sealed so that nothing else interferes with it. Another way to be able to make the signal better is to increase the signal making the ratio bigger.

11.) Using the following diagram describe the Modulation and Demodulation operation of the Modem   
Describe the input signal for each stage, and what the signal looks like at its output.

The sender wants to send a certain string of data to a receiver. He wants the data to be safe and to get to the receiver and look the same as when sent. A number of problems arise that need a solution to be able to do this process of sending data. The sender and receiver might be using a different system. The line being used to send the data ususally needs a different representation of the data to be able to transmit. Another thing is a safety concern. You don’t want anyone to intercept your data and steal your cc information!

The Encoder is the person sending the message. He will put what he wants to send in his language to be transmitted. Then we will go to the Modulator. The Modulator will transform the data into transmittable data. If until now I had the data in low frequency now the Baseband modulator will transform that signal into a higher transmittable frequency. This might be done by amplitude modulation, frequency modulation and phase modulation. The carrier Modulator will encode the signal even further by adding a certain frequency, amplitude or phase that the carrier demodulator will know how to put back to its original form. The baseband Demodulator will turn the data back to the encoded data. And finally the Decoder, the receiver, will have to put the information into a form that he could read. In the input the information could look very different then the output because the machines being used could be using very different languages.

12.) Nyquist’s Formula describes how many bits per second it is possible to transmit in a noiseless channel given the bandwidth and the number of bits per signal. From this formula we learn the maximum rate that we could transmit data(the speed of light). Yet to be proven wrong. The formula (capacity in bits/s)=2\*(bandwidth)\*(n bits in symbol).

13.) Shannon’s Capacity Formula takes the snr (signal to noise ratio) into account and gives us a more practical transfer rate, as there is a lot of noise around, although we still underscore for this. His formula is

(capacity)=(bandwidth)\*.

**Group question # 2**

1. Given: a data communication channel that connects two stations: Channel settings between station 1 and station 2:

Channel bandwidth 1 MHz (1x106 Hz)

Channel propagation delay is 0.0001 seconds.

The channel broadcasts Symbols at the maximum rate according to Nyquist

In each symbol, two bits are sent

The signal propagation speed in the channel is 2x108 meters per second.

Uses frames with a maximum size of 500 bytes (1 byte = 8 bits)

(All answers are given approximately, show all formulas and calculations)

* 1. What is the distance between station 1 and station 2?

Formula: (distance/velocity)=propagation delay. (Distance?/2\*10^8meters\seconds)=0.0001seconds distance=20,000meters =20km

A) 40 km

B) 40 meters

C) 20 km

D) 20 meters

E) 10 meters

F) The previous answers are not close to the correct answer

* 1. What is the maximum bit rate between station 1 and station 2? (capacity in bits/s)=2\*(1MHz)\*(2)

A) 16x10^6 bits / second

B) 10x10^6 bits / second

C) 8x10^6 bits / second

D) 4x10^6 bits / second

E) 2x10^6 bits / second

F) The previous answers are not close to the correct answer

* 1. What is the maximum frame rate transmission time between station 1 and station 2?

Length of message / rate of tranmssion= time= 4000bits/ 4x10^6 bits per second=(1/1000)

A) 0.001 seconds

B) 0.002 seconds

C) 0.004 seconds

D) 0.000125 seconds

E) 0.00050 seconds

F) The previous answers are not close to the correct answer

* 1. What is the level of signal-to-noise (SNR) required in the channel between station 1 and station 2 according to a witty law? We are not discussing snr in this case not applicable.

A) 6dB

B) 12db

C) 16db

D) 24db

E) 48db

F) The previous answers are not close to the correct answer

1. A noise-free channel with a bandwidth of 5000 Hz and you want to broadcast it at a rate of at least 30,000 bits per second.   
   What is the number of L levels required?

formula (capacity in bits/s)=2\*(bandwidth)\*(). 30,000/10,000=).=8

A) 2 levels

B) 4 levels

C) 6 levels

D) 8 levels

E) All previous answers are incorrect.

1. A signal given at a power of 100 mW with a noise of 1 mW.   
    What is the value of the (Signal-to-Noise Ratio) SNR in this case?

A) 10db

B) 20db

C) 30db

D) 40db

E) 60db

1. Suppose 1 PC needs to send a large file to 2 PC, the two computers are on different LANs, and are separated by a chain of routers. What is the longest unit (in homes) that passes through the network from 1PC to 2PC? Explain your choice.

A) Application messages

B) PDU of layer 3

C) Segment

D) PDU of layer 5

E) Frame this is the data ready to be transmitted. With all the attachments from all the layers with it. Therefore the longest.

1. Assume that the video is broadcast on a 4.5 Mhz bandwidth channel, with SNRdb equal to 35. What is the maximum data rate of the channel (bps)? View the calculation for your answer (formulas and explanation) (capacity)=(bandwidth)\* Shanons capacity formula

Capacity=4,500,000hz\* = 23264662 bits per second round down the half. You can’t transmit a half.

1. Suppose you want to send a shipment of CDs with a courier. Each CD contains 8.54 gigabytes of data. Shipping includes 9,000 CDs. The journey time of the courier from the source to the destination is two hours. What is the data rate in the bits of the messenger? View the calculation for your answer (formulas and explanation) 76860gb are being transmitted (number of cds\* data per cd) In 2 hours 1gb=8,000,000,000 bits. 2 hours = 7,200 seconds so 1,111,111 bits per second are being transmitted.

Question Group 3:



Data Communications Model

Among the components of the system drawn in rectangles, six interfaces are numbered 1 to 6.

Here are the three types of interfaces that can serve this model:

* 1. Analog information only interface
  2. Digital (digital) information only interface
  3. . An interface that can be used for analog or digital information

Indicate in the sections below: 1 to 6, what type of interface is most appropriate (A, B or C)?

1. Interface 1: Digital (digital) information only interface

2. Interface 2: An interface that can be used for analog or digital information

3. Interface 3: Analog information only interface

4. Interface 4: Analog information only interface

5. Interface 5: An interface that can be used for analog or digital information

6. Interface 6: Digital (digital) information only interface