If you have a composite signal with 55 khz as its bandwidth, and the highest signal frequency is 155 khz, what is the minimum frequency?  
  
Communication mode  
simplex, half duplex, full duplex  
  
If you have ASK signal transmiting at 8000bps, and the transmission mode is using half duplex? What is the minimum bandwidth for that signal?  
  
since half duplex so 8000/2 = 4000 bps  
  
In data communication we need address to determine device identity  
  
IP address -> IPv4 (decimal format 32 bit) and IPv6 (Hexadecimal format 128 bit) logical addressing  
Mac address physical addressing, the first 24 bit contain information about manufacturer, the next 24 bit contain unique numbers to represent the hardware identity (Hexadecimal format) length 48 bits.  
  
Logical addressing can change  
Physical address never changes  
  
IP address we use for source to destination delivery  
  
Mac address we use for hop to hop delivery  
  
Node to node delivery  
Intermediate system  
  
OSI model / TCP/ip model  
  
data encoding  
digital signal encoding  
digital data to digital signal unipolar NRZ, polar NRZ - L, Manchester  
  
Analog signal encoding  
ASK - amplitude to create the carrier signal  
FSK - Frequency to create the carrier signal  
PSK - Phases to create the carrier signal  
QPSK - (QAM method that combine ASK and PSK together)  
  
Process  
1) Digital data to digital signal  
2) create the carrier signal using analog signal encoding technique  
3) Combine the digital signal with carrier signal to become modulated signal  
  
factors that affect the transmission quality  
Attenuation, distortion, noise, SNR  
  
At transport layer we have protocol  
Connection oriented protocol  
Example TCP protocol. If using connection oriented protocol, sender and receiver need to establish connection first before sender will send the data out. TCP packet will have sequence number so that receiver can rearrange the packet in the order that the sender are sending. Application example like email.  
  
Connectionless protocol  
Example is UDP protocol. UDP never establish connection between sender and receiver. It only care to send the data packet out as fast as possible from sender to receiver. There is no sequence number. Example video streaming application like youtube use UDP protocol.  
  
Network topology, Bus, ring, star, mesh, hybrid topology(how to describe, draw, advantage and disadvantage)  
  
Data communication standard De facto and De Jure  
  
Time Domain plot and frequency domain plot  
Draw time domain plot with Ampliture 10 volts, period is 0.5 sec, phases 90 degree  
  
Draw frequency domain plot with 5khz, 15 khz, 20 khz, and 30 khz with amplitude 10 volts and phase is 270 degree