長庚大學 99 學年度通訊系統第一次小考

1. What is analog data and what is digital data? (10 points)

Ans: analog data, for instance, photos, pictures, human voice, and songs, etc.

digital data, for instance, VCD, DVD, and computer images, etc.

2. Please instantiate an example for each data transmission scheme: (20 points)

　甲、Digital data using digital signals for transmission

　a computer communication over a digital subscriber line (DSL)

　乙、Digital data using analog signals for transmission

　a computer communication over a modem (modulation/demodulation)

　丙、Analog data using digital signals for transmission

　a 2G/3G mobile phone system

　丁、Analog data using analog signals for transmission

　an AM/FM radio

3. What is baseband transmission? What is low pass transmission? (10 points)

Ans: Baseband transmission means sending a digital signal over a channel without changing the digital signal to an analog signal.

Low pass transmission means that we have a low-pass channel, a channel with a bandwidth that starts from zero.

4. What is attenuation? (10 points)

Ans: 指電磁波的衰減

5. Consider a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with two signal levels. What is the maximum bit rate this channel can achieve? (25 points) [Hint: Biterate = 2 x bandwidth x $\log_2 L$]

Ans: Biterate = $2*3000*\log_2 2$ = 6000 bits/second = 6kbps

6. Assume a telephone line normally has a bandwidth of 3000 Hz (300 to 3300 Hz) assigned for data communications. The signal-to-noise ratio is usually 1023. For this channel, what is the maximum channel capacity? (25 points) [Hint: $C = B$ x $\log_2(1+SNR)$]

Ans: $C = 3000 * \log_2(1+1023)$ = 3000 * 10 = 30000 bits/second = 30kbps