國立澎湖科技大學
九十八學年度研究所入學考試試題

科目:通訊系統

—作答注意事項—

考試時間：100 分鐘

作答方式：請用黑色或藍色筆在「答案卷」上作答

祝考試順利

國立澎湖科技大學 98 學年度研究所入學考試試題

電資研究所

科目:通訊系統

1. Plot the block diagram of communication systems. What is the goal of communication systems? (15%)
2. What is modulation?

   Write the techniques of modulation (including analog and digital modulation). (15%)
3. Write transmission bandwidth B and transmission frequency range of linear modulation as below. The frequency of baseband signal is $f_m = 100\text{Hz}$, the frequency of carrier signal is $f_c = 2000\text{Hz}$, and the frequency of residual bandwidth is $\beta = 20Hz$.(20%)

Modulation Method	transmission bandwidth B	transmission frequency range
AM		~
DSB		~
USSB		~
LSSB		~
VSB		~

4. Given a band-pass signal, $x(t)$, with its Fourier transform, $X(f)$, as shown in Fig. P-4.

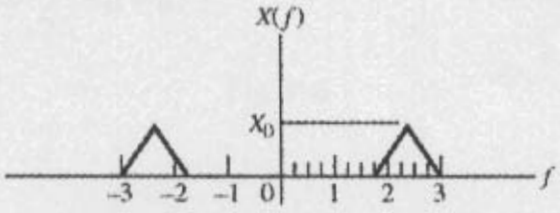

Fig. P-4

   a. Show graphically that the minimum allowable sampling frequency, $f_{s,\min}$, for the band-pass signal, $X(f)$. (5 points)
   b. What is "aliasing effect." (5 points)

5. Consider a binary FSK transmission system that transmits $s_1(t) = \cos(2\pi f_1 t)$ or $s_2(t) = \cos(2\pi f_2 t)$ in time interval $0 \le t \le T$. The binary bits, $s_1(t)$ and $s_2(t)$, are transmitted over an additive white Gaussian noise channel with zero mean and two-sided power spectral density $N_0/2$ Watt/Hz.

   a. Find cross-correlation of $s_1(t)$ and $s_2(t)$, γ_{12}. (5 points)
   b. Select proper frequency spacing $\Delta f = f_1 - f_2$, that makes $s_1(t)$ and $s_2(t)$ orthogonal in the interval $0 \le t \le T$. (5 points)
   c. Design a receiver that can minimize the average bit-error probability, P_E. (10 points)

6. Consider an FM modulator with frequency-deviation constant f_d, expressed in hertz per unit of input information message, $m(t)$. The output of the FM modulator is $s_{FM}(t)$.

   a. Express mathematically the FM modulated signal, $s_{FM}(t)$. (5 points)
   b. Sketch block diagram for a FM demodulator using "zero-crossing detector." (5 points)

Fig. P-6 shows a PAM generator with input signal $m(t)$. The sampled signal $m_s(t)$ is filtered by a pulse shaping filter $h(t)$. Please derive the PAM signal output, $s_{PAM}(t)$, and its Fourier transform, $S_{PAM}(f)$. (10 points)

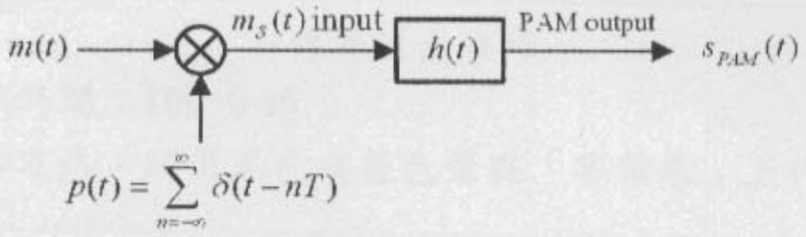

Fig. P-6