國立中央大學八十四學年度碩士班研究生入學試題卷

1. (A)Use the Gram-schmidt procedure to find a set of orthonormal basic functions corresponding to the
(10%) signals given in Fug.1.

(B)Expressed the signal $s_1(t)$ as a linear combination of the orthogonal sets in part(A) and find the integral square error.

2. Consider a system with amplitude response and phase shift shown in try 2a and 2b. Find the corresponding
(10%) output for the following inputs:

(A) $x(t) = \cos 10\pi t + \cos 26\pi t$

$x(t) = \cos 26\pi t + \cos 34\pi t$

3. An FM modulator has carrier frequency $f_c = 1000Hz$, and frequency deviation constant
(10%) $f_d = 10Hz/v$. The modulator has input $m(t) = 5\cos 2\pi(10)t$

(A) What is the modulation index

(B) If the same $m(t)$ is used for a phase modulation, what must be the phase deviation constant k_p be to yield the index given in problem(A)?

4.Given the cumulative distribution function(CDF)
(15%)

$$F_x(x) = \begin{cases} 0 & x < 0 \\ x^2 & 0 \le x \le 1 \\ 1 & x > 1 \end{cases}$$

(A)Find and plot the probability density function of this CDF.

(B)Find $P(0.5 < x \le 0.75)$

(C)Find $P(x \le 0.5)$

5. A 3-Bit PCM system with input signal m(t)=cosWmt Volts. Find the mean square quantization error and
(10%) quantization signal to noise ratio.

6. (A)Differentially encode the binary sequence 100100100101, Arbitrarily choose a 1 as the reference bit to
(10%) begin the encoding process.

(B)Differentially decode the binary sequence 111011011110,for which the encoding process is identical to that of problem(A).

7. (A)Find the bandwidth efficiency for the 32-QASK and 32-FSK, coherent.
(10%)(B)On the basis of null-to-null-bandwidths,find the minimum transmission bandwidths of 32-QASK and coherent 32-FSK to achieve a bit rate of 50KB/S.

8.Consider $\hat{x}(t)$ is the Hilbert transform of signal $x(t)$, show that

(10%)(A)$x(t)$ and $\hat{x}(t)$ are orthogonal

(B)The Energies of $x(t)$ and $\hat{x}(t)$ are equal

9.Consider a (7,4) systematic block code whose parity-check equation are

$$P_1 = m_1 + m_2 + m_3$$
$$P_2 = m_2 + m_3 + m_4$$
$$P_3 = m_1 + m_2 + m_4$$

(15%) Where m_i are message digits and P_i are parity digits

(A)Find the generator matrix and parity check matrix for the code.

(B)A received sequence is 0110101 commute the syndrome and find possible error

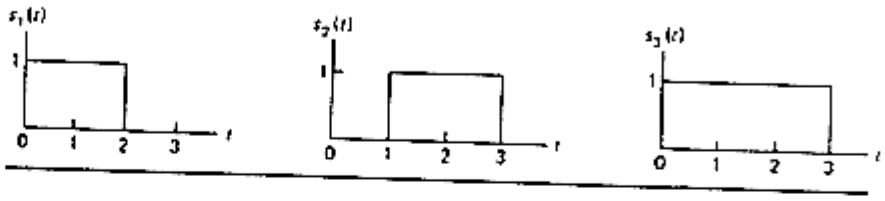

FIGURE 1.

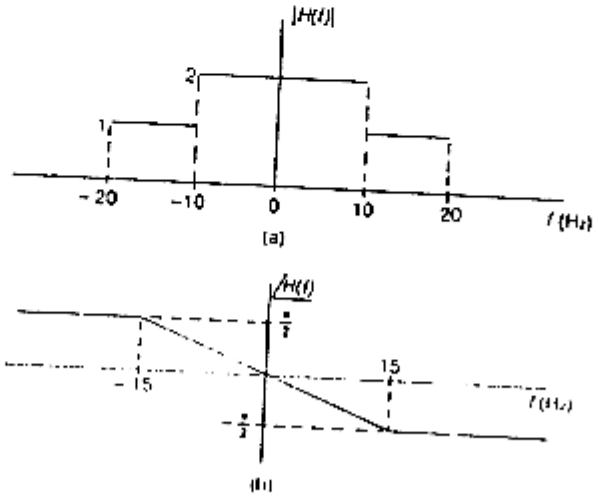

FIGURE 2. (a) Amplitude response. (b) Phase response.