

國立臺北科技大學九十八學年度碩士班招生考試

系所組別：2140 電機工程系碩士班丁組

第一節 通訊原理 試題

第一頁 共一頁

注意事項：

1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、(20%) (每小題 10 分)

The message signal $m(t) = A_m \cos(2\pi f_m t)$ is frequency modulated with carrier

$$c(t) = A_c \cos(2\pi f_c t).$$

1. Show that the narrowband FM signal can be approximated by

$$s(t) \cong A_c \cos(2\pi f_c t) - \beta A_c \sin(2\pi f_c t) \sin(2\pi f_m t).$$

2. Plot the magnitude spectrum of $s(t)$.

二、(20%)

Find the mean and autocorrelation function of the random process

$$X(t) = X \cos(2\pi f_0 t) + Y \sin(2\pi f_0 t), \text{ where } X \text{ and } Y \text{ are two zero-mean}$$

independent random variables each with variance σ^2 .

三、(20%) (每小題 10 分)

1. Show that the impulse response the Hilbert transformer is $\frac{1}{\pi t}$.
2. Explain the meaning of the Hilbert transformer.

四、(20%) (每小題 10 分)

For a coherent BPSK system, the two signals are defined by $s_1(t) = \cos(2\pi f_c t)$ and

$$s_2(t) = \cos(2\pi f_c t + \frac{3\pi}{4}), \quad 0 \leq t \leq T_b.$$

1. Draw a signal space diagram for this scheme.
2. In the presence of additive white Gaussian noise of zero mean and power spectral density $\frac{N_0}{2}$, calculate the average probability of error.

五、(20%) (每小題 10 分)

Consider the (6,2) code C with generator matrix $G = \begin{pmatrix} 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \end{pmatrix}$.

1. List all the codewords of C .
2. Find the parity check matrix of C .

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