

國立臺北科技大學九十七學年度碩士班招生考試

系所組別：2220 電腦與通訊研究所乙組

第二節 通訊系統 試題

填准考證號碼

第一頁 共一頁

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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、(24%)

An AM broadcast station uses a modulation index of 0.7071 and an average carrier power of 40 kW for transmission. Assume that a signal $x(t) = 4 \cos(2\pi f_0 t)$ is transmitted, find

1. the Fourier transform of $x(t)$, (4%)
2. the power spectral density of $x(t)$, (4%)
3. the average power of $x(t)$, (4%)
4. the total average transmission power, and (6%)
5. the transmission efficiency. (6%)

二、(10%)

A channel-coding scheme consists of codewords:

- $c_1 = [0001011]$,
- $c_2 = [1110000]$,
- $c_3 = [1000110]$,
- $c_4 = [1111011]$,
- $c_5 = [0110110]$,
- $c_6 = [1001101]$,
- $c_7 = [0111101]$,
- $c_8 = [0000000]$.

If a sequence $x = 1101011$ is received, what is the decoded (closest) codeword based on the Hamming weight and Hamming distance, respectively?

三、(28%)

1. Describe and explain how to reduce the interference in an FM system. (14%)
2. Consider a communication system, in which the transmitted signal is $x(t)$, and the received signal is $x_r(t) = x(t) + \beta x(t-\alpha)$, due to the multipath interference. Discuss what the effect of such an interference is and how to solve it, when the delay factor α is small and large, respectively. (14%)

四、(24%)

A communication system is shown in Fig. 1.

1. Find (Sketch) the matched filter $h(t)$ for $s_1(t)$ and $s_2(t)$ shown in Fig. 2. (8%)
2. Find the maximal SNR at the receiver, if $n(t)$ is AWGN with PSD of $N_0/2$. (8%)
3. Find the optimal threshold k . (8%)

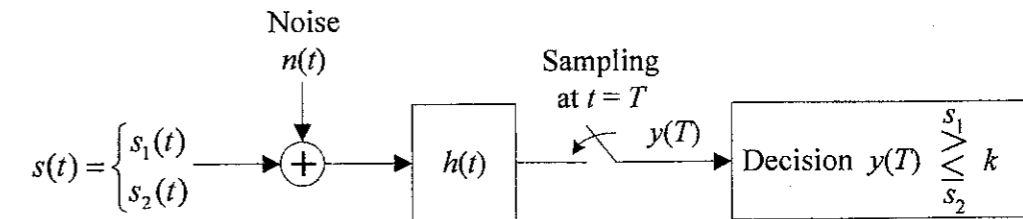


Fig. 1

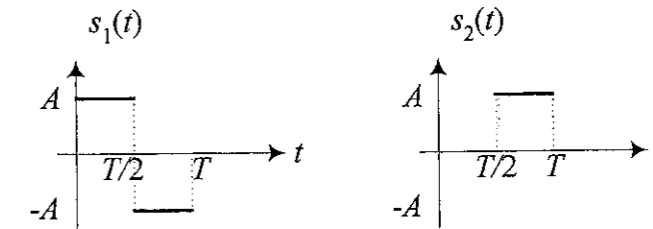


Fig. 2

五、(14%)

Consider a BPSK detector as shown in Fig. 3, in which a phase error θ occurs. Find the average probability of error in terms of error function.

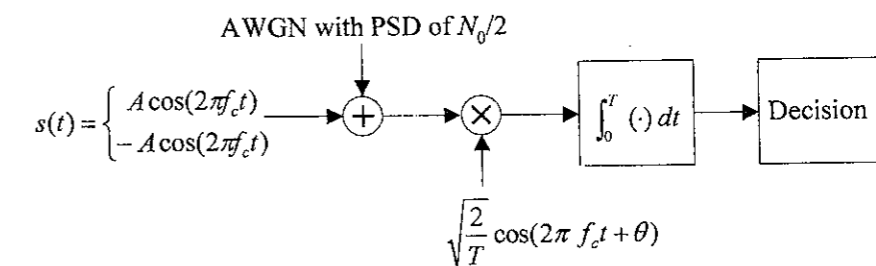


Fig. 3