

國立臺北科技大學

九十二學年度電機工程系博士班入學考試

通訊原理（電機乙組）試題

填准考證號碼

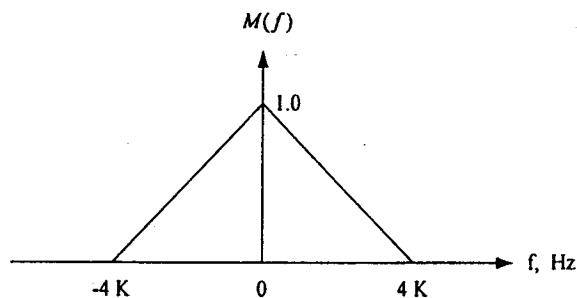
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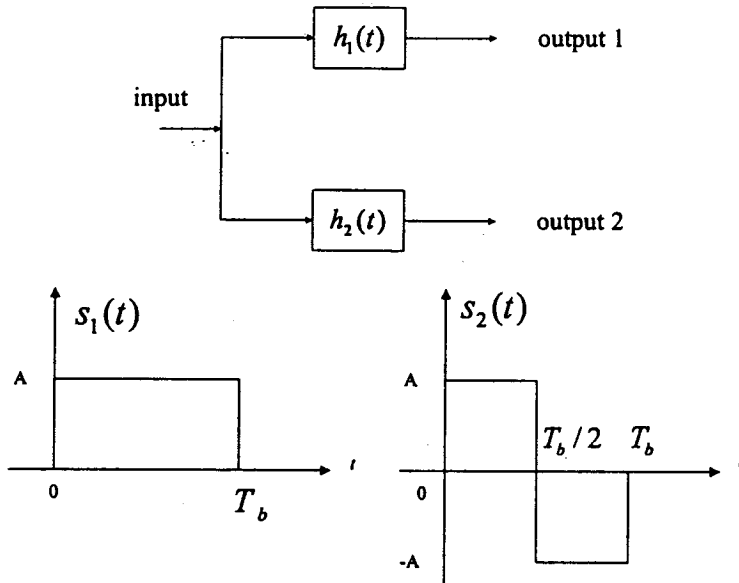
注意事項：

1. 本試題共【6】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. Give each of the following terms a brief explanation.
 - (a) Binary Symmetric Channel (BSC). (6%)
 - (b) Additive White Gaussian Noise (AWGN). (6%)
 - (c) Digital Signal One (DS1). (6%)
 - (d) Synchronous Optical Network (SONET). (6%)
2. A low pass signal $m(t)$ which has the spectrum shown below is sampled by an ideal sampler.
 - (a) Determine the minimum required sampling rate. (8%)
 - (b) Sketch the spectrum after sampling. (8%)



3. A system for detecting signals $s_1(t)$ and $s_2(t)$ is shown below, where $h_1(t)$ and $h_2(t)$ are matched to $s_1(t)$ and $s_2(t)$, respectively.
- (a) Sketch the impulse response of the filters $h_1(t)$ and $h_2(t)$. (8%)
- (b) Sketch the output waveform of the matched filters when $s_1(t)$ is transmitted. (8%)



4. An analog signal is sampled, quantized, and encoded into a binary PCM wave. The sampling rate and representation levels of the PCM system are 8000 samples and 256 (i.e., 8-bit quantization), respectively. Determine the transmission bandwidth required for transmitting the binary PCM wave if rolloff factor are zero and unity, respectively. (12%)
5. Let $X(t) = \cos(2\pi f_c t + \Theta)$ where f_c is a constant and Θ is a random variable that is uniformly distributed over the interval $(-\pi, \pi)$, that is,

$$f_{\Theta}(\theta) = \begin{cases} \frac{1}{2\pi}, & -\pi \leq \theta \leq \pi \\ 0, & \text{elsewhere} \end{cases}$$

- (a) Find the autocorrelation function of $X(t)$. (5%)
- (b) Is $X(t)$ wide-sense stationary? Why? (5%)
- (c) Find the power spectral density function of $X(t)$. (5%)
- (d) Find the average power of $X(t)$ to a $1 - \Omega$ resistor. (5%)
6. For the amplitude-shift keying (ASK), phase-shift keying (PSK), and frequency-shift keying (FSK) schemes, answer the following questions.
- (a) Which of them can be used in nonlinear channel? (6%)
- (b) Which of them must be coherently detected? (6%)