

國立臺北科技大學 106 學年度碩士班招生考試

系所組別：2141 電機工程系碩士班丁組

第一節 通訊原理 試題 (選考)

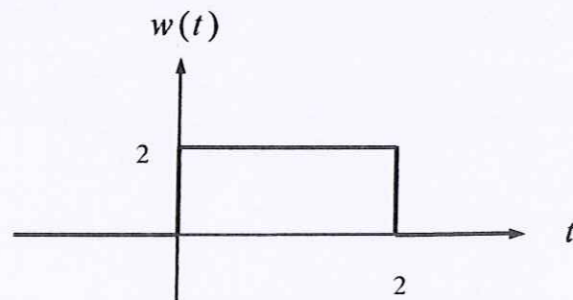
第一頁 共一頁

注意事項：

1. 本試題共五題，每題 20 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%)

Find the Fourier transform of $w(t)e^{j\pi t}$.



二、(20%)

An FM modulated signal $10 \cos[20000\pi t + 3 \sin(20\pi t)]$ is transmitted through an ideal band-pass filter with midband frequency 9970 Hz and bandwidth 30 Hz. Please calculate the average power of the filter output.

n \ x	$J_n(x)$			
	0.5	1	2	3
0	0.9385	0.7652	0.2239	-0.2601
1	0.2423	0.4401	0.5767	0.3391
2	0.0306	0.1149	0.3528	0.4861
3	0.0026	0.0196	0.1289	0.3091
4	0.0002	0.0025	0.0340	0.1320
5	—	0.0002	0.0070	0.0430
6	—	—	0.0012	0.0114
7	—	—	0.0002	0.0025
8	—	—	—	0.0005
9	—	—	—	0.0001

三、(20%) (每小題 10 分)

1. Sketch the impulse response $h(t)$ of the filter matched to the input $g(t) = \begin{cases} 1, & 0 \leq t \leq T/2 \\ 0, & \text{else} \end{cases}$.
2. Plot the filter output $s(t)$ as a function of time.

Hint: $h(t) = kg(T - t)$

四、(20%)

The signal $m(t) = 3.8 \cos(2\pi t)$ is transmitted using a 4-bit binary PCM system. Assume the samples are taken at $t = 1/6$ and $2/3$, find the PCM output sequence.

五、(20%) (每小題 10 分)

Consider the coherent detector for the DSB modulated signal $s(t) = m(t) \cos(2000\pi t)$ where $m(t) = \text{sinc}^2(t)$. The PSD of white noise $w(t)$ is 0.1 W/Hz. The ideal band-pass filter $H_1(f)$ has midband frequency 1000 Hz and bandwidth 2 Hz. The bandwidth of the ideal low-pass filter $H_2(f)$ is 1 Hz.

1. Plot the spectra of $x(t)$ and $y(t)$.
2. Find the noise power in $x(t)$ and $y(t)$.

