

臺中健康暨管理學院

九十二學年度碩士班暨碩士在職專班招生考試試題紙

系 所 別	組 別	考試科目	考試日期	時 間	備 註
電腦與通訊學系碩士班	--	通訊原理	92.3.30	10:30-12:10	共二頁

1. (10%) Find the PSD (power spectral density) and the power of a sinusoidal waveform

$$f(t) = A \cos(\omega_0 t + \theta).$$
2. (15%) A baseband signal $f(t)$ bandlimited to B Hz modulates a carrier of frequency ω_c . The modulated signal $f(t)\cos\omega_c t$ is transmitted over a channel whose input x and the output y are related as $y = a_1 x + a_2 x^2 + a_3 x^3$.
Find the received signal and sketch its spectrum.
3. (15%) Assume that an analog voice-frequency signal, which occupies a band from 300 to 3400 Hz, is to be transmitted over a binary PCM system. What is the minimum sampling frequency? In practice a sampling frequency of 8 kHz is the standard used in telephone communication systems. In such case, assume that each sample value is represented by 7 information bits plus 1 parity bit; then, what is the minimum absolute bandwidth of the PCM signal if the PCM waveform consists of $(\sin x)/x$ pulse shapes? the peak signal-to-quantizing noise power ratio?
4. (15%) A character-interleaved TDM is used to combine the data streams of a number of 110 bits/sec asynchronous terminals for data transmission over a 2400 bits/sec digital line. Each terminal sends characters consisting of 7 data bits, 1 parity bit, 1 start bit, and 2 stop bits. Assume that one synchronization character is sent after every 19 data characters and at least 3% of the line capacity is reserved for pulse stuffing to accommodate speed variations from the various terminals.
 - (a) Determine the number of bits per character.
 - (b) Determine the number of terminals that can be accommodated by the multiplexer.
 - (c) Sketch a possible framing pattern for the multiplexer.
5. (15%) An information-bearing signal $f(t)$ has the spectrum shown in Fig. 1.
 - (a) What is the minimum sampling frequency f_s to avoid aliasing?
 - (b) Sketch the spectrum of the sampled signal when sampled at f_s . Why would f_s not be used in practice?
 - (c) Sketch the spectrum of the sampled signal when $f(t)$ is sampled at a rate $f_s = 6$ kHz, and determine the band of alias frequencies.
6. (20%) Determine the transfer function $H(f)$ of the simple RC low-pass filter shown in Fig. 2, where $R = 1$ k Ω and $C = \frac{250}{\pi}$ nF.
 - (a) Obtain the output spectrum when the input signal is an impulse function $\delta(t)$.
 - (b) Determine the output voltage $y(t)$ for an input voltage $x(t) = 10\cos(2000\pi t + 40^\circ)$.
 - (c) Determine the bandwidth of the filter.
7. (10%) A binary-symmetric-channel (BSC) error probability is P_e . The probability of transmitting 1 is Q , and that of transmitting 0 is $1-Q$, as shown in Fig. 3. Determine the probabilities of receiving 1 and 0 at the receiver.

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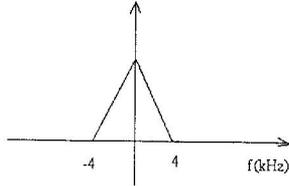


Fig. 1

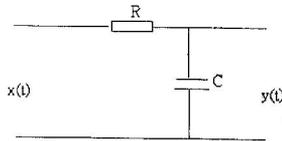


Fig. 2

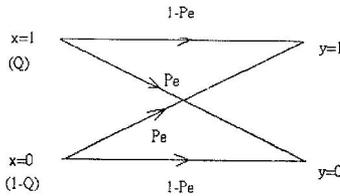


Fig. 3