

淡江大學 96 學年度碩士班招生考試試題

系別：電機工程學系

科目：通 信 系 統

准帶項目請打「V」
✓ 簡單型計算機

本試題共 / 頁

1. $y(t) = 0.5x(t) + 0.02x^2(t) + 0.01x^3(t) + 0.005x^4(t)$ for $x(t) = \cos 200\pi t$, then.
- (1) Find the DC component. (10%)
 - (2) Find the second-harmonic distortion in percent. (10%)

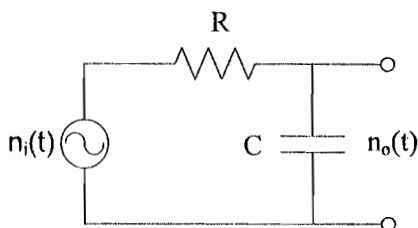
2. Find and sketch $|H(f)|$ and $\arg H(f)$ for a system described by the differential equation
- $$dy(t)/dt + 20\pi y(t) = dx(t)/dt + 2\pi x(t). \quad (20\%)$$

3. Consider a modulating wave $m(t) = A_m \cos 2\pi f_m t$ and the sinusoidal carrier wave has amplitude A_c and frequency f_c . Therefore the corresponding AM wave is given by
- $$s(t) = A_c (1 + \mu \cos \omega_m t) \cos \omega_c t$$

where μ is called the modulation index of AM modulation.

- (1) Let A_{\max} and A_{\min} denote the maximum and minimum values of the envelope of the modulated wave. Express the modulation index in terms of A_{\max} and A_{\min} . (5%)
- (2) Find the Fourier transform of $s(t)$ and draw the amplitude spectrum of $S(f)$. (5%)
- (3) Find the carrier power, USSB power, and LSSB power for $R_L = 1\Omega$. (5%)
- (4) Determine the efficiency (η) of the modulator. (5%)

4. The input to the low pass RC filter shown in figure is white Gaussian noise with power spectral density $S_m(f) = N_0/2$, $-\infty < f < \infty$.



- (1) Determine the power spectral density of the output. (5%)
- (2) Determine the output autocorrelation function. (10%)
- (3) Find the average power at the filter output. (5%)

5. (1) Find the power spectral density of a binary PAM signal with polar RZ format and rectangular pulses as illustrated in figure, assuming independent and equiprobable message bits. (10%)
- (2) Show that the time-domain and frequency-domain calculations of $E[x^2]$ are in agreement. (10%)

