淡江大學 95 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」	
V	簡單型計算機

本試題共 2 頁

本試題雙面印製

1. A block diagram of a Quadrature Amplitude Modulation System is shown in Fig.1. Assume that $f_1(t)$ and $f_2(t)$ have bandwith w_0, where $w_0 << w_c$ and w_c is the carrier frequency. We form the following signals: $g_1(t) = \phi(t)\cos w_c t$, $g_2(t) = \phi(t)\sin w_c t$. $g_1(t)$ and $g_2(t)$ are filtered by ideal low-pass filters with cutoff frequency of $2w_0$ and unit amplitude to form the output signals $e_1(t)$ and $e_2(t)$.
Determine $g_1(t)$, $g_2(t)$, $e_1(t)$ and $e_2(t)$

20%

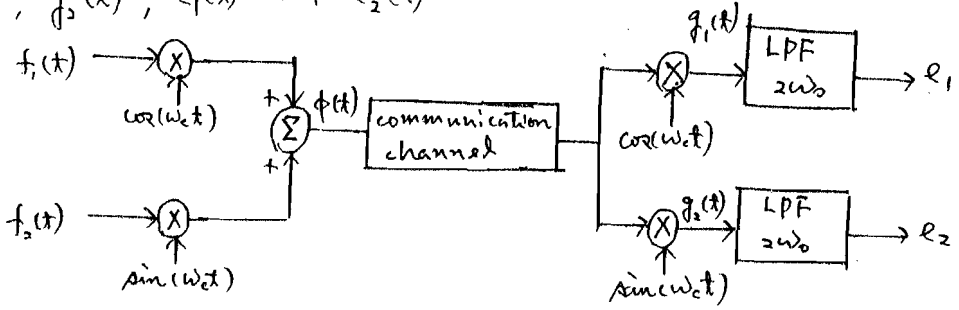

Fig.1

20%

2. The system shown in Fig.2 is used, with a sampling rate of 2.4MHz, to time-division multiplex a number of pulse amplitude-modulated signals.
(a) If the pulses are 8 μs in duration, how many PAM signals can be multiplexed?
(b) If the pulses are 8 μs in duration, what is the first-null bandwidth of the TDM signal?

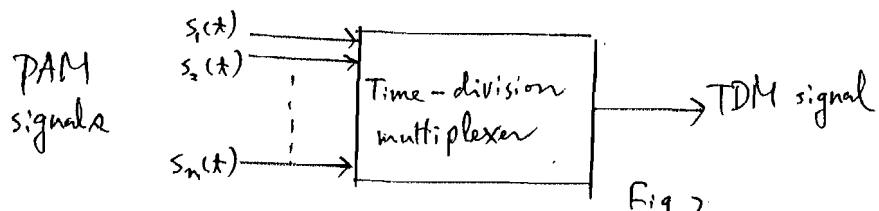

Fig.2

25%

3. Given the two four-point sequences $x[n] = [-2, -1, 0, 2]$ and $y[n] = [-1, -2, -1, -3]$, determine (a) the linear convolution (b) the circular convolution
(c) the cross-correlation of $x[n]$ and $y[n]$
(d) the cross-correlation of $y[n]$ and $x[n]$
(e) the autocorrelation of $x[n]$

淡江大學 95 學年度碩士班招生考試試題

69-2

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 2 頁

4. Find the Hilbert Transform of the sine function $\sin(2\pi f_c t)$? (10%)

5(25%)

Consider an M-ary PAM signal set in which the basic pulse shape $g_T(t)$ is rectangular as shown in Fig. 3. The additive noise is a zero-mean white Gaussian noise process. Determine the basis function $\psi(t)$ and the output of the correlation-type demodulator.

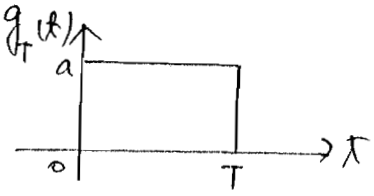

Fig. 3