

國立臺北大學 104 學年度碩士班一般入學考試試題

系（所）組別：通訊工程學系

科目：通訊原理

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可 不可使用計算機

1. (10%) In wireless communication systems, Additive White Gaussian Noise (AWGN) channel is often assumed. What do “Additive”, “White”, and “Gaussian” mean?
2. (10%) Let $X(t) = A\cos(2\pi f_0 t + \Theta)$, where A is a constant and Θ is a random variable uniformly distributed on $[0, \pi]$. Find the autocorrelation and the power-spectral density of $X(t)$.
3. (10%) Plot the 16QAM constellation with normalized power 1. How many bits can one symbol carry for system with 16QAM?
4. (20 %) Given $\varphi_1(t) = 1$, $\varphi_2(t) = t$, $\varphi_3(t) = 3t^2 - 1$,
 - (a) Show that $\varphi_1(t)$ and $\varphi_2(t)$ are mutually orthogonal over the interval $(-1, 1)$
 - (b) Are $\varphi_1(t)$ and $\varphi_3(t)$ mutually orthogonal over the interval $(-1, 1)$? Why or why not?
5. (30 %) Please answer the following questions with True(T) or False(F)
 - (a) Phase modulation is a digital modulation scheme.
 - (b) The amplitude of Frequency Modulation (FM) is constant.
 - (c) The signal bandwidth of Amplitude Modulation (AM) is larger than FM.
 - (d) AM is an angle modulation scheme.
 - (e) For FM, the transmission power remains constant irrespective of modulation index.
 - (f) For Phase Modulation (PM), amplitude of carrier is varied according to the amplitude of modulation signals.
6. (10%) A carrier is frequency modulated with a sinusoidal signal of 2 kHz resulting in a maximum frequency deviation of 5kHz.
Find (a) modulation index (b) Bandwidth of the modulated signal
7. (10%) By giving the message $m(t)$ and carrier $A_c \cos(2\pi f_c t)$
 - (a) Find the amplitude-modulated signal
 - (b) Explain how to demodulate the signal of (a)