

國立臺北科技大學九十五學年度碩士班招生考試

系所組別：1720 電腦與通訊研究所乙組

第二節 通訊系統 試題

填准考證號碼

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第一頁 共一頁

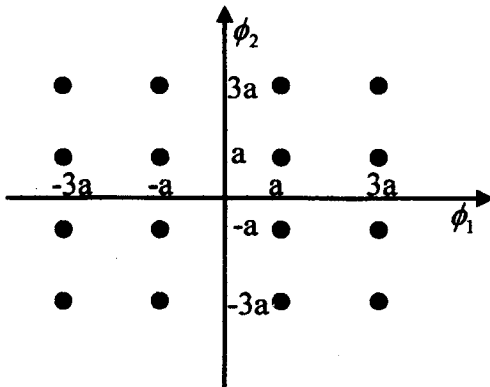
注意事項：

1. 本試題共 5 題，配分共 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 points) Describe the properties of additive white Gaussian noise (AWGN).

二、 (20 points) Consider a digital communication system, where the data bits are modulated by 8-ary PSK and the duration of each modulated signal is 4×10^{-6} seconds. Find the transmission rate (in bits /second) of this system.

三、 (20 points) Consider a 16 QAM modulation with signal constellation plotted in the following figure, where $\phi_1(t) = \sqrt{\frac{2}{T}} \cos(2\pi f_c t)$ and $\phi_2(t) = \sqrt{\frac{2}{T}} \sin(2\pi f_c t)$, $0 \leq t \leq T$. Let $s(t)$ be the modulated signal and $n(t)$ be the additive white Gaussian noise. The received signal is $r(t) = Hs(t) + n(t)$, where H is the fading of the channel. Assume that the receiver know the value of H . Please plot the block diagram of the optimal receiver and explain the decision rule.



四、 (20 points) Consider an on-off keying modulation with signals $s_0(t) = 0$ and $s_1(t) = a$ for $0 < t < T$, where T is the duration of the signal.

1. Find the average bit energy.
2. Compare the performance of this modulation with that of the nonreturn-to-zero signaling (where $s_0(t) = -b$ and $s_1(t) = b$ for $0 < t < T$) both in bit error rate and bandwidth.

五、 (20 points) Consider a band-pass signal

$$s(t) = 50 \cos(22000\pi t) + 100 \cos(20000\pi t) + 150 \cos(18000\pi t).$$

with center frequency $f_c = 10000$. Let $\tilde{s}(t)$ be the complex envelope of $s(t)$.

1. Find the Fourier transform of $s(t)$. (6 points)
2. Find the Fourier transform of $\tilde{s}(t)$. (6 points)
3. Find $\tilde{s}(t)$. (8 points)