

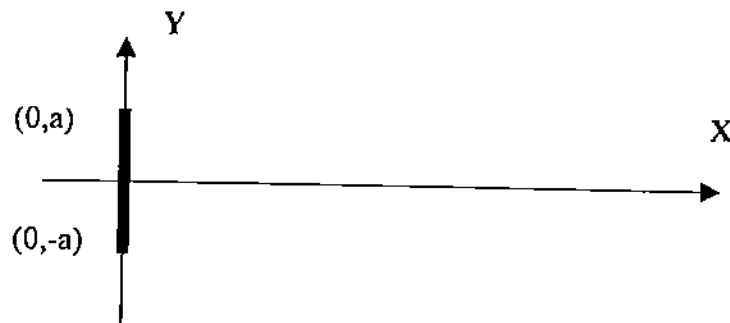
大葉大學九十一學年度 研究所博士班 招生考試試題紙

系 所	組 別	考 試 科 目 (中文名稱)	考 試 日 期	節 次	備 註
電機工程學系 博士班	丙組	電信工程	6月28日	第一節	可因下列條件 P2-1

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

計算與問答題：(共六題，選答其中之四題，每題 25 分)

- The electric charge Q is uniformly distributed on the wire with $2a$ in length. Please find the electric field \vec{E} at $(x, 0)$.



- A current I is excited on the loop $x^2 + y^2 = a^2$ and a point charge Q is located at $(0,0,0)$. In addition, another point charge q is moving in the velocity $\vec{V} = V_0 \hat{a}_x$ at $(0,0,z)$. What is the force on this charge q ?
- Please write down the differential-form Maxwell equations and describe the meaning briefly.

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電機工程學系 博士班	丙組	電信工程	6月28日	第一節	P2-2

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List of abbreviations:

MHz: mega Hz, *kbps*: kilo bits per second, *W*: Watts, *mW*: mili Watts, AWGN: Additive White Gaussian Noise, *ms*: millisecond. BPSK: binary phase shift keying, BER: bit error Rate/Probability.

4. If the maximum likelihood is used for binary decision, the likelihood ratio is given as

$$\Lambda(z) = \frac{p(z|s_1)}{p(z|s_2)} \underset{H_2}{>} \frac{p(s_2)}{p(s_1)}$$

where $p(z|s_1)$ and $p(z|s_2)$ represent the likelihood probabilities when $s_1(t)$ and $s_2(t)$ are sent, respectively, while $p(s_1)$ and $p(s_2)$ are a priori probabilities for $s_1(t)$ and $s_2(t)$, respectively. In the above likelihood ratio equation, H_1 and H_2 represent hypothesis 1 and 2 corresponding a decision of $s_1(t)$ and $s_2(t)$, respectively. Consider that a bipolar binary signal, $s_i(t)$ ($i=1,2$), of amplitude $\pm A$ is received in the presence of AWGN having a variance of $0.1 A^2$. Determine the optimal detection threshold, γ_0 , for matched filter detection if the a priori probabilities are: (a) $p(s_1)=0.5$; (b) $p(s_1)=0.7$.

5. Suppose that BPSK modulation is used for transmitting information over a AWGN channel having a power loss of 9.5 dB and an AWGN of a single sided PSD of $N_0 = 10^{-10}$ W/Hz. The transmitted BPSK signal has an amplitude of A and a bit duration of T . If the required BER is 10^{-6} or less, corresponding to a bit energy-to-noise-PSD ratio, $E_b/N_0 = 10.5$ dB or higher, determine the required amplitude level when the data rate is (1) 10 kbps, and (2) 100 kbps.
6. What is QPSK, OQPSK (offset/delayed QPSK), and $\pi/4$ -shift QPSK? Compare their performance in terms of envelope constancy and spectral compactness.