大葉大學 101 學年度　研究所碩士班　招生考試試題紙

系　所　別	組別	考　試　科　目 （中　文　名　稱）	考　試 日　期	節　次	備　　註
電機工程學系碩士班	丙	工程數學(微分方程、機率)	3 月 17 日	第 一 節	考乙頁 (0:30~12:00)

說明 1：可否攜帶特殊作答輔助工具：☑否　□是，考生可使用＿＿＿＿＿＿＿＿＿＿＿（如未註明，一律不准攜帶）

1. **Permutations(排列)**　(10 points)

   How many distinct permutations that draws 4 cards from a 52 play cards ? You can use the formula P_r^n, where n and r are the total number and the necessary number, respectively.

2. **Combination(組合)**　(10 points)

   A boy asks his girl friend to get five game cartridges from his collection of 10 arcade and 5 sports games. How many ways are there that his girl friend will get 3 arcade and 2 sports games, respectively?

3. **Probability density function(機率密度函數)**　(10 points)

   Suppose that the error in the reaction temperature, in ^{0}C, for a controlled laboratory experiment is a continuous random variable X having the pdf

   $$f(x) = \begin{cases} \dfrac{x^2}{3}, & -1 < x < 2 \\ 0, & elsewhere \end{cases}$$

   (a) Verify that $\int_{-\infty}^{\infty} f(x)dx = 1$, (b)Find $P(0 < X \le 1)$.

4. **Joint Probability density function (聯合 pdf)**　(10 points)

   The joint density for the random variables (X, Y), where X is the unit temperature change and Y is the proportion of spectrum shift that a certain atomic particle products is

   $$f(x,y) = \begin{cases} 10xy^2, & 0 < x < y < 1 \\ 0, & elsewhere \end{cases}$$

   find the marginal density $g(x)$, $h(y)$ and the conditional density $f(y|x)$.

5. **Means and variances of random variables(平均值與變異數)** (20 points)

   Let X be a random variable with density function

   $$f(x) = \begin{cases} \dfrac{x^2}{3}, & -1 < x < 2 \\ 0, & elsewhere \end{cases}$$

   Now, a new random variable Y=4X+3, (a)Find the mean of X? (b)Find the mean of Y?

   Differential equations

6. Solve $2xyy' - y^2 + x^2 = 0$　(10 points)

7. Solve the initial value

   (a) $x^2 y'' + 2xy - x + 1 = 0$, $y(1) = 0$.　(b) Solve (a) by the Laplace transformation. (15 points)

8. Could you give me some study plan for the graduate if you are going to pass the examination? (15 points)