

國立臺北科技大學 105 學年度碩士班招生考試

系所組別：2143 電機工程系碩士班丁組

第二節 機率 試題 (選考)

第一頁 共一頁

注意事項：

1. 本試題共五題，每題 20 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、 The probability density function of random variable Y is $f_Y(y) = \begin{cases} cy^2 & -1 \leq y \leq 1 \\ 0 & \text{otherwise.} \end{cases}$

1. Find the constant c . (10%)
2. Find the CDF of Y . (10%)

二、 The probability density function of random variable X is $f_X(x) = \begin{cases} \lambda e^{-\lambda x} & x \geq 0, \\ 0 & \text{otherwise.} \end{cases}$

1. Find the moment generating function $\phi_X(s)$. (10%)
2. Use $\phi_X(s)$ to find the first moment and second moment of X . (10%)

三、 Find the probability density function of $W = X + Y$ when X and Y have the joint

probability density function $f_{X,Y}(x,y) = \begin{cases} 1 & 0 \leq x \leq 1, 0 \leq y \leq 1, \\ 0 & \text{otherwise.} \end{cases}$ (20%)

四、 Random variables X and Y have joint probability density function

$$f_{X,Y}(x,y) = \begin{cases} \frac{1}{2} & -1 \leq x \leq y \leq 1, \\ 0 & \text{otherwise.} \end{cases}$$

1. Find the marginal probability density functions $f_X(x)$ and $f_Y(y)$. (10%)
2. Find the covariance of X and Y . (10%)

五、 Roll an unfair four-sided die two times. Suppose that the probabilities for 1, 2, 3, and 4

are $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{4}$, and 0, respectively.

1. Let N denote the sum of the first roll and the second roll. Find the probability mass function $P_N(n)$. (10%)
2. Let A denote the event that two rolls are both odd. Let B denote the event that the first roll is equal to the second roll. Find the conditional probability $P[B|A]$. (10%)