國立臺北科技大學 112 學年度碩士班招生考試

系所組別：2141 電機工程系碩士班丁組

第一節機率試題（選考）

注意事項：

1. 本試題共 5 題，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. In an experiment, A and B are events with probabilities $P[A] = 1/8$ and $P[B] = 3/8$.

   Suppose A and B are disjoint. Find $P[A \cup B]$ and $P[A \cup B^C]$. (10 %)

2. The PMF of V is $P_V(v) = \begin{cases} cv^2 & v = 1,2,3,4, \\ 0 & \text{otherwise.} \end{cases}$

   Find the value of the constant c and the CDF of V. (20 %)

3. The PDF of X is $f_X(x) = \begin{cases} \dfrac{x^2}{24} & -2 \le x \le 4, \\ 0 & \text{otherwise.} \end{cases}$

   If $Y = X^2$, find the PDF $f_Y(y)$. (20 %)

4. Random variables X and Y have joint PDF $f_{X,Y}(x,y) = \begin{cases} cx & 0 \le x \le 2, \ -2 \le y \le 2, \\ 0 & \text{otherwise.} \end{cases}$

   Find the constant c and the probability $P[X^2 + Y^2 \le 4]$. (25 %)

5. Random variables X and Y have joint PDF $f_{X,Y}(x,y) = \begin{cases} 8xy & 0 \le y \le x \le 1, \\ 0 & \text{otherwise.} \end{cases}$

   Find the covariance of X and Y. (25 %)