國立彰化師範大學106學年度碩士班招生考試試題

系所：電信工程學研究所(選考戊)、資訊工程學系(選考辛)　　科目：線性代數與機率

☆☆請在答案紙上作答☆☆　　

1. Use Gauss-Jordan elimination to solve the system. (10%)
   $2x + y + 2z = 4$
   $2x + 2y = 5$
   $2x - y + 6z = 2$

2. $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & a \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ b & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}, a \neq 0.$ Find $|A|$ and A^{-1}. (20%)

3. Let **u** = (5, −1, 4), **v** = (−3, 1, −3), **w** = (1, 0, 1) in R^3. Write **x** = (2, 1, 1) as a linear combination of **u**, **v**, and **w**. (10%)

4. In $\boldsymbol{C}[0, 2\pi]$, with the inner product $\langle f, g\rangle = \int_0^{2\pi} f(x)g(x)dx$, find $\|\cos(x)\|$ and $\langle \cos(x), \sin(x)\rangle$. (10%)

5. Please explain the following random variables: (20%)
   (1) Bernoulli random variable
   (2) Poisson random variable
   (3) Uniform random variable
   (4) Normal random variable

6. (1) Please explain the Binomial theorem. (5%)
   (2) Please employ the binomial theorem to find
   $\sum_{k=0}^{10} \binom{10}{k}$. (5%)

7. Find the expected value and variance of the Bernoulli random variable with parameter p. (10%)

8. X and Y are independent random variables. X is uniformly distributed on (−1, 1). Y is uniformly distributed on (0, 1). Calculate the probability density of $X + Y$. (10%)