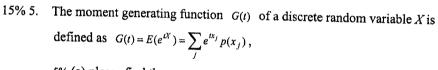
## 國立中央大學九十二學年度碩士班考試入學招生試題卷

共/頁第/頁

系所別:

通訊工程學系 甲組 科目: ZJ:49

- 10% 1. Let  $\{x, y, z\}$  be a basis for a vector space V. Please show that  $\{x+y, y, x+y+z\}$ is also a basis for V.
- 12% 2. Please compute the inverse of (a)  $\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$  (b)  $\begin{bmatrix} 2 & 1 & -3 \\ 3 & 1 & 0 \\ -6 & -4 & 2 \end{bmatrix}$ .
- 12% 3. Let A and B be unitary matrices. Please show that the inverse of the matrix C=AB is also unitary.
- 16% 4. Find a matrix Q such that  $Q^{-1}AQ$  is a diagonal matrix for  $A = \begin{bmatrix} 3 & 1 & 1 \\ 2 & 4 & 2 \\ -1 & -1 & 1 \end{bmatrix}$ .



5% (a) please find the moment generating function G(t) of the Poisson distribution given by  $p(x) = \frac{a^x}{x!} e^{-a}$   $x = 0,1,2,\dots$ 

10% (b) please use the moment generating function G(t) to find the mean  $\mu$  and variance  $\sigma^2$  of the Poisson distribution.

The probability density function of a normal (Gaussian) random variable Xis given by  $f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{x^2}{2\sigma^2}}$ ,

> 5% (a) please compute  $P(X \le 5|X > 1)$  in terms of Q-function with the Q-function defined as  $Q(x) = \int_{x}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}} dz$ .

5% (b) please find the mean E(Y) of the random variable  $Y = 5X^2 + 10$ . 10% (c) please find the probability density function  $f_z(z)$  of the random variable Z = 2X + 5.

15% 7. Consider two independent random variables X and Y with probability density function given respectively by  $f_x(x) = \alpha e^{-\alpha x} u(x)$  and  $f_y(y) = 1$  if  $0 < y \le 1$ , please find the probability density function  $f_z(z)$  of the random variable Z = X + Y.

