国立成功大学九十五学年度硕士班招生考试试题

共 二頁 第 12

繼號: 6 272 系所:電腦與通信工程研究所乙組

科目:通信數學

本試壓是否可以使用計算機: 口可使用 , 口不可使用 (請命避老師勾遷)

1. Consider a population of size n, $n \ge 0$, of a certain species in which individuals do not reproduce. However, new individuals immigrate into the population at a Poisson rate of γ . If the lifetime of an individual in the population is exponential with mean $1/\mu$, find πi , $i \ge 0$, the long-run probability that the population size is i. (10%)

- 2. From the set of integers {1, 2, 3, ..., 100000} a number is selected at random. What is the probability that the sum of its digits is 8? (10%)
- 3. Adam and three of his friends are playing bridge. (a) If, holding a certain hand, Adam announces that he has a king, what is the probability that he has at least one more king? (b) If, for some other hand, Adam announces that he has the king of diamonds, what is the probability that he has at least one more king? (15%)
- 4. Suppose that n random integers are selected from $\{1, 2, \ldots, N\}$ with replacement. What is the expected value of the largest number selected? Show that for large N the answer is approximately nN/(n+1). (15%)

(背面仍有題目,請繼續作答)

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5. Let $x \in \mathbb{R}^n$. Show that $|x| \le n |x| \le n |x| \le \sqrt{n} |x| \le \sqrt{n} |x| \le (2 \times 5\%)$

6. Let u be a unit vector in \mathbb{R}^n and let $A = I - 2uu^T$. Determine A^{-1} . The mattern of the month ngi na (**(10%)**) da an in proden na di

7. (a) Is the matrix
$$A = \begin{bmatrix} \alpha & 1 & 0 \\ 0 & \alpha & 1 \\ 0 & 0 & \beta \end{bmatrix}$$
 defective? Why? (b) Find e^{At} . (4%,

6%)

- 大田 (1971年)。**9**93年(第4年) at retains a state . 8. Suppose $Ax = \lambda x$, $A \in \mathbb{R}^{n \times n}$, and $x \neq 0$. Is e^{λ} an eigenvalue of e^{A} ? Why? (10%)
- 9. Suppose $Ax = \lambda x$, $A \in \mathbb{C}^{n \times n}$, $x \neq 0$, and A is a skew Hermitian matrix. Is λ real or purely imaginary? Why? (10%)

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