國立中央大學 106 學年度碩士班考試入學試題

所別： 產業經濟研究所 碩士班 產經組(一般生) 共2頁 第1頁

科目： 統計學

本科考試禁用計算器 除答案之外，計算過程或步驟必須列出 *請在答案卷內作答

參考用

1. Assume a random variable Y has a probability density function given by

$$f(y) = \begin{cases} (3/64)y^2(4-y), & 0 \le y \le 4 \\ 0, & otherwise \end{cases}$$

(a) Find $E(y)$ and $V(Y)$. (6%)

(b) Find an interval shorter than $(0, 4)$ in which at least $3/4$ of the y must lie. (5%)

(c) Would you expect to see a y below 2 very often? (4%)

2. Four Mr. A's political polls, n =10 voters were sampled. We wish to test $H_0: P = 0.4$ against the alternative $H_0: P < 0.4$. The test statistic is Y, the number of sampled voters favoring Mr. A.

(a) Calculate α (Type I error) if we select $\{Y \le 2\}$ as the rejection region. [Hint: write down the mathematical expression will be fine, no need to calculate the accurate figures]. (7%)

(b) Suppose the Mr. A will receive 30% of the votes ($P = 0.3$). What will be the probability of β (Type II error) that the sample will erroneously lead us to conclude that H_0 is true and Mr. A is going to win. [Hint: write down the mathematical expression will be fine, no need to calculate the accurate figures]. (8%)

3. A manufacturer purchases a particular material from two different suppliers. The mean level of defective material is approximately the same for both suppliers. But the manufacturer is concerned about the variability of the defects from shipment to shipment. To compare the variation in percentage of defects for the two suppliers, the manufacturer selects twenty shipments from each of the two supplies and measure the percentage of defects in the materials for each shipment. The sample means and variances are shown as follows.

Supplier 1	Supplier 2
$\overline{y_1} = 1.89$	$\overline{y_2} = 1.85$
$S_1^2 = 0.373$	$S_2^2 = 0.094$
$n_1 = 20$	$n_2 = 20$

Do the data provide sufficient evidence to indicate a difference in the variability of the shipment defective levels for the two suppliers? Test using 10% significance level. (10%)

注意:背面有試題

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4. The number of traffic accidents at a particular street follows a Poisson distribution and is found to be an average of 4 per month. During the last month 7 accidents occurred.
   (a) Does this number seem highly improbable if $\mu = 7$? (7%)
   (b) Does it indicate an increase in the mean μ? [Hint: $e^{-4} \cong 0.018$)] (8%)

5. The service times for a patient coming to a physician's office are independent random variables with mean 7.5 minutes and variance 1.0. Please approximate the probability that 100 patients can be serviced in less than 10 hours of total service time. (15%)

6. A and B are two gamblers, each have $6 dollars. They bet $ 1 each on the successive tosses of a coin.
   (a) What is the probability that they break even after 3 tosses of the coin? (7%)
   (b) What is the probability that A wins all the money on the tenth toss of the coin? (8%)

7. Let $Y_1, Y_2, \ldots, Y_n$ denotes independent and identically distributed uniform random variables on the interval $(0, 4\theta)$.
   (a) Derive the method of moment estimator for θ. (7%)
   (b) Fellow (a) and assume the probability density function of Y_i is $f(Y_i|\theta) = 1/4\theta$. Derive the maximum likelihood estimator of the θ. (8%)

The End.