

國立清華大學 命題紙

八十四學年度 工業工程 所在職 組碩士班研究生入學考試

科目 工程統計 科號 300/ 共 3 頁第 2 頁 *請在試卷【答案卷】內作答

- (20分) 5. Assume that you are an engineer for a car manufacturer. Your job is to design a new disk for front disk brakes that is more durable than the one currently in use. For your study you select a sample of 10 brand-new cars that are all of the same type. The following table shows the disk's performance, which is measured by the the loss of the material on the disk.

	cars										sample mean, ^{squared of} sample variance
	1	2	3	4	5	6	7	8	9	10	
New disk Y_1	7	3	3	4	8	3	2	9	5	4	$\bar{Y}_1 = 4.8, S_1^2 = 5.7333$
Old disk Y_2	6	3	5	3	8	2	4	9	4	5	$\bar{Y}_2 = 4.9, S_2^2 = 4.9889$

Answer the following questions: Use $\alpha = 0.05$ for any test.

- (a) Make inferences about the difference in the mean loss of the material for the new and old disk, assuming that car effect is negligible. (Make any appropriate assumptions if you need).
- (b) Make inferences about the difference in the mean loss of the material for the new and old disk, assuming that car effect cannot be ignored. (Make any appropriate assumptions if you need).
- (15分) 6. There is about 20 percent of the students have grades above 70 for 1993 master entrance examination. Professor Wang found that 20 among of 80 students have grades above 70 for 1994 master entrance examination. Does this support Professor Wang's claim that the improvement has been made. Use $\alpha = 0.05$.
- (a) Write down the null and alternative hypotheses.
- (b) Give the best procedure to make such a decision.
- (c) What is your decision based on the above procedure.

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科目 工程統計 科號 300 / 共 3 頁第 1 頁 *請在試卷【答案卷】內作答

1. (10分) 假設一轟炸機的轟炸目標是一個半徑為一哩的圓的中心，一枚炸彈會隨機落在這個圓內的任一點，而炸彈會摧毀在落點1/2哩範圍內的所有物體，則炸一次目標被摧毀的機率有多大？

2. (18分) 某單位嘗試抽驗某品牌市售袋裝米，以觀察其平均重量是否符合米袋上所宣示，假設抽驗了N包米，請問以 $\bar{X} = \frac{1}{N} \sum_{i=1}^N X_i$ 或是

$$\hat{\mu} = \frac{1}{N-1} \sum_{i=1}^{N-1} X_i$$

去估計平均重量 μ 較佳？為什麼？

3. (17分) 在化學工廠中的酸性氣體必須去除以防止工廠腐蝕，對兩種去除酸性氣體的方法，在實驗室測試時得到以下的腐蝕率(mm/年)：

方法A：0.3, 0.7, 0.5, 0.8, 0.9, 0.7, 0.8

方法B：0.7, 0.8, 0.7, 0.6, 2.1, 0.6, 1.4, 2.3

試估計這兩種方法的平均腐蝕率的差，並作出95%的信賴區間，亦請說明有那些假設。

4. (20分) 假設 X 為一連續隨機函數，其機率分配為

$$f(x) = \begin{cases} 2x & , 0 \leq x \leq 2 \\ \frac{x}{2} - A & , 2 < x \leq 4 \\ 0 & , \text{otherwise} \end{cases}$$

試求：(1) A 之值

(2) 累積分配函數 $F(x)$ ，並繪其圖

(3) $P(1 \leq X \leq 3)$

(4) $E[X(1-X)]$