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淡江大學 105 學年度日間部轉學生招生考試試題

系別：統計學系三年級

科目：統計與機率

考試日期：7月22日(星期五) 第1節

本試題共 6 大題， 2 頁

本試題雙面印刷

第一題 (8分)

是非題。下列敘述，正確的請答○；錯誤的請答×，不用說明理由。

1. (4分) 令 $\alpha = P(\text{Type I error})$ 和 $\beta = P(\text{Type II error})$ ，則 $\alpha + \beta = 1$ 恆成立。
2. (4分) 假設 X_1, \dots, X_n 為來自 $N(\mu, 1)$ 的一組隨機樣本，考慮假設檢定問題 $H_0: \mu \leq \mu_0$ v.s. $H_1: \mu > \mu_0$ ，若危險域 $C = \{\bar{x} > k\}$ ，則當 k 越大時，可使 type I error 和 type II error 發生的機率同時減小。

第二題 (24分)

選擇題，答題時題號請標示清楚。

A manufacturer has three production lines A, B, and C. The manager observed the quantity of output in 4, 4, and 3 days for A, B, and C, respectively, and the mean values of output are 6.75, 8.75, and 14. The manager constructed the following ANOVA table.

Variation	Sum of squares	Degrees of freedom	Mean square	F
Between	(a)	(c)	46.6137	(e)
Within	(b)	(d)	0.9375	
Total		10		

1. (4分) What is the value of (a)?
(A) 93.2274 (B) 139.8411 (C) 46.6137 (D) None of the above
2. (4分) What is the value of (b)?
(A) 8.4375 (B) 6.5625 (C) 7.5000 (D) 5.6250
3. (4分) What is the value of (c)?
(A) 1 (B) 2 (C) 3 (D) 4
4. (4分) What is the value of (d)?
(A) 7 (B) 8 (C) 9 (D) 10
5. (4分) What is the value of (e)?
(A) 7.1030 (B) 21.3091 (C) 12.4437 (D) 49.7213
6. (4分) At $\alpha = 0.05$, is there enough evidence to conclude that at least one of the mean output is different from the others? (Hint: $F_{0.05(2,8)} = 4.46$)
 - (A) There is enough evidence to conclude that at least one of the mean output is different from the others.
 - (B) There is not enough evidence to conclude that at least one of the mean output is different from the others.
 - (C) There is too few evidence to conclude that at least one of the mean output is different from the others.
 - (D) None of the above

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第三題 (8 分)

選擇題，答題時題號請標示清楚。

Give $P(A) = 0.5$ and $P(A \cup B) = 0.7$.

1. (4 分) What is $P(B)$ if A and B are independent?

(A) 0.2 (B) 0.3 (C) 0.4 (D) 0.5

2. (4 分) What is $P(B)$ if A and B are disjoint?

(A) 0.2 (B) 0.3 (C) 0.4 (D) 0.5

第四題 (12 分)

Let discrete random variable X have probability distribution

$$f(x) = \begin{cases} \frac{|x|}{10} & \text{for } x = -3, -2, 2, 3 \\ 0 & \text{elsewhere.} \end{cases}$$

1. (6 分) Find $E(X)$.

2. (6 分) Obtain $E(X^2)$.

第五題 (24 分)

Suppose that the distribution of a random variable X is

$$f(x) = \begin{cases} e^{-x}, & x > 0, \\ 0, & \text{elsewhere.} \end{cases}$$

1. (6 分) Show that f is, indeed, a p.d.f.

2. (6 分) Obtain the m.g.f. of X .

3. (6 分) Find the expectation of $2X + 1$.

4. (6 分) Find the median of X .

第六題 (24 分)

Let the random variables X_1 and X_2 have joint p.d.f. given by

$$f(x_1, x_2) = \begin{cases} 1, & 0 < x_1 < 1, 0 < x_2 < 1, \\ 0, & \text{elsewhere.} \end{cases}$$

1. (6 分) Show that X_1 and X_2 are independent.

2. (6 分) Are X_1 and X_2 uncorrelated? Why?

3. (6 分) Compute $P(X_1 + X_2 < \frac{1}{3})$.

4. (6 分) Obtain $P(X_1 X_2 > \frac{1}{2})$.