考試科目	統計學	所別	財政系	考試時間	月　日 星期	上/下午第　節

1. (21 points) The probability density of the continuous random variable X is given by

$$f(x)=\begin{cases}\frac{1}{5}-\frac{1}{25}|x-c| & \text{for } 2<x<12\\ 0 & \text{elsewhere}\end{cases}$$

Find
(a) the values of c;
(b) the expected value of X, E(X);
(c) the variance of X, Var(X).

2. (21 points) A Gallup poll found that 22% of 200 men and 16% of 300 women surveyed favored a tax reform proposal.
(a) What is the point estimate of the difference between the two population proportions?
(b) Construct a 95% confidence interval for the difference between the two population proportions.
(c) With a 5% significance level, can you claim that the proportion of men who favored such a tax proposal was equal to that of women?

3. (21 points) Let R^2 = SSR/SST denote the coefficient of determination for the sample regression line of Y on X with the slope b.

(a) Show that $R^2=b^2\dfrac{\sum_{i=1}^{n}(X_i-\bar{X})^2}{\sum_{i=1}^{n}(Y_i-\bar{Y})^2}$

(b) Prove that the coefficient of determination is equal to the square of the sample correlation between X and Y.
(c) Let b^* be the slope of the least square regression of X on Y, and r the sample correlation between X and Y.
Prove that $bb^*=r^2$.

4. (21 points) The data gathered for a two-way factorial design follow.

		Treatment 1 A1	A2	A3
Treatment 2	B1	23	21	20
		25	21	22
	B2	27	24	26
		28	27	27

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Use the two-way ANOVA to analyze these data. Let the significance level $\alpha = 0.01$.

(a) Test whether or not row means all are equal.

(b) Test whether or not column means all are equal.

(c) Test whether or not the interaction effects are zero.

(Hint: $F_{0.01,1,6} = 13.75$, $F_{0.01,2,6} = 10.92$, $F_{0.01,3,6} = 9.78$,
$F_{0.01,1,12} = 9.33$, $F_{0.01,2,12} = 6.93$, $F_{0.01,3,12} = 5.95$.)

5. (16 points) Prove that if $S^2 (= \frac{1}{n-1}\sum_{i=1}^{n}(X_i - \bar{X})^2)$ is the variance of a random sample from an infinite population with the finite variance σ^2, then S^2 is an unbiased estimator of the population variance σ^2; that is $E(S^2) = \sigma^2$.

備　　　　考　　試題隨卷繳交