國立政治大學九十之 學年度研究所(博/碩)士班入學考試

考試科目	統計學	所別	財政	考試時間	3月19日 星期日 第4節

1 (10 points) The probability density of the random variable Z is given by

$$f(z)=\begin{cases} kze^{-z^2} & \text{for } z>0 \\ 0 & \text{for } z\le 0 \end{cases}$$

Find k and draw both of the graph of this probability density and distribution functions.

2 (10 points) Show that if X is a random variable with the mean μ for which $f(x)=0$ for $x<0$, then for any positive constant a,

$$P(X\ge a)\le \frac{\mu}{a}.$$

3 (10 points) Show that if $\hat{\theta}$ is an unbiased estimator of θ and $\text{var}(\hat{\theta})\neq 0$, then $\hat{\theta}^2$ is not an unbiased estimator of θ^2.

4 (15 points) The following are the average monthly losses of the excise tax due to tax exemptions in 10 items before and after a certain tax reform was put into operation:

45 and 36, 73 and 60, 46 and 44, 124 and 119, 33 and 35,
57 and 51, 83 and 77, 34 and 29, 26 and 24, and 17 and 11.

Test whether the tax reform is effective with the 0.05 level of significance.

5 (15 points) The following sample data pertain to the shipments received by a large firm from three different vendors:

	Number rejected	Number imperfect but acceptable	Number perfect
Vendor A	12	23	89
Vendor B	8	12	62
Vendor C	21	30	119

Use Chi-square to test whether the three vendors ship products of equal quantities at the 0.05 level of significance.

備考	試題隨卷繳交

命題委員： ：108 （簽章）

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考試科目	統計學	所別	財政 3131	考試時間	3月19日 星期日 第4節

6 (20 points) The following are the cholesterol contents, in milligrams per package, which four laboratories obtained for 6-ounce packages of three very similar diet foods:

	Diet food A	Diet food B	Diet food C
Laboratory 1	3.4	2.6	2.8
Laboratory 2	3.0	2.7	3.1
Laboratory 3	3.3	3.0	3.4
Laboratory 4	3.5	3.1	3.7

Perform a two-way analysis of variance and test the null hypotheses concerning the differences in the diet foods and in the laboratories at the 0.05 level of significance.

7 (20 points) The following are sample data provided by a moving company on the weights of six shipments, the distances they were moved, and the damage that was incurred:

Weight (1,000 lb) x_1	Distance (1,000 miles) x_2	Damage (1,000 dollars) y
4.0	1.5	160
3.0	2.2	112
1.6	1.0	69
1.2	2.0	90
3.4	0.8	123
4.8	1.6	186

(a) Assuming that the regression is the linear equation of the form

$\mu_{Y|x_1,x_2} = \beta_0 + \beta_1 x_1 + \beta_2 x_2$, estimate β_0, β_1 and β_2.

(b) Use the results of part (a) to estimate the damage when a shipment weighing 2,400 pounds is moved 1,200 miles.

Appendix:

$t_{0.025,18} = 2.10; t_{0.05,18} = 1.73; t_{0.025,9} = 2.26; t_{0.05,9} = 1.83;$

$\chi^2_{0.05,4} = 9.49; \chi^2_{0.05,8} = 15.51; \chi^2_{0.025,4} = 11.14; \chi^2_{0.025,8} = 17.54;$

$F_{0.025,3,6} = 6.60; F_{0.025,2,6} = 7.26; F_{0.05,3,6} = 4.76; F_{0.05,2,6} = 5.14.$

備考	試題隨卷繳交

命題委員： 109 （簽章）

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