Part I: Answer whether the following statements are true, false, or uncertain <u>with reasons</u>. <u>**No reasons, no points**</u>. (30%)

1. An experiment consists of tossing a single die and observing the number of dots that show on the upper face. Evens A, B, and C are defined as follows:
   A: Observing a number less than 4
   B: Observing a number less than or equal to 2
   C: Observing a number greater than 3
   Events A and B are mutually exclusive. (6%)

2. If X and Y have the joint probability distribution $f(-1,\ 0)=0$, $f(-1,\ 1)=1/4$, $f(0,\ 0)=1/6$, $f(0,\ 1)=0$, $f(1,\ 0)=1/12$, and $f(1,\ 1)=1/2$. The two random variables, X and Y, are independent. (6%)

3. If there is correlation between the two variables, this means that one variable "causes" the other variable. (6%)

4. If $X=\ln Y$ has a normal distribution with the mean μ and the standard deviation σ. Y is said to have log-normal distribution. (6%)

5. If a random sample of size n is selected from the finite population that consists of the integers 1, 2, …, N, the mean of $Y=n\bar{X}$ is $E(Y)=\frac{n(N+1)}{2}$. (6%)

Part II: (20%)

1. If 132 of 200 male voters and 90 of 159 female voters favor a certain candidate running for governor of Taipei county, find a 99% confidence interval for the difference between the actual proportions of male and female voters who favor the candidate (Note $Z_{0.01}=2.326$ and $Z_{0.005}=2.575$). (10%)

2. If X_1 and X_2 are independent random variables having exponential densities with parameters θ_1 and θ_2, find the probability density of $Y=X_1+X_2$ when
   (a) $\theta_1 \neq \theta_2$; (5%)
   (b) $\theta_1 = \theta_2$. (5%)
   [Note that the density function of an exponential distribution is $f(X)=\frac{1}{\theta}e^{-X/\theta}$]

參考用

Part Ⅲ(30%)

State with reasons whether the following statements are true, false, or uncertain. Be precise. No reasons, no points.

1. Suppose the classical linear model $Y_i = \beta_1 + \beta_2 \chi_i + \varepsilon_i$, were estimated by OLS. The slope coefficient in the regression of x on y is just the inverse of the slope from the regressing of y on x. (6%)
2. In the regression $Y_i = \beta_1 + \beta_2 \chi_i + \varepsilon_i$, suppose we multiple each x value by a constant. This will change the residuals and fitted values of y. (6%)
3. Even though the disturbance term in the classical linear model is not normally distributed, the OLS estimators are still unbiased. (6%)
4. If an extra explanatory variable is added to a regression, the estimate of the variance of the disturbance term will remain the same or fall. (6%)
5. In the regression model that contains the intercept, the sum of the residuals is always zero. (6%)

Part Ⅳ(20%)

Consider the following models:

$$\ln Y_i^* = \alpha_1 + \alpha_2 \ln \chi_i^* + \varepsilon_i^*$$

$$\ln Y_i = \beta_1 + \beta_2 \ln \chi_i + \varepsilon_i$$

Where $Y_i^* = \omega_1 Y_i$ and $\chi_i^* = \omega_2 \chi_i$, the ω_1 and ω_2 are constants.

1. Establish the relationships between the two sets of regression coefficients and their standard errors. (10%)
2. Is the r^2 different between the two models? (10%)

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