系所組別：統計學系

考試科目：統計學

考試日期：0223，節次：3

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參考值： $t_{20,0.05}=1.7247$，$t_{20,0.025}=2.086$，$\chi^2_{19,0.025}=32.8523$，$\chi^2_{19,0.975}=8.90655$，$\chi^2_{19,0.95}=10.1170$，$\chi^2_{20,0.025}=34.1696$，

$\chi^2_{20,0.975}=9.59083$，$\chi^2_{19,0.05}=30.1435$，$F_{2,10,0.05}=4.1028$，$F_{3,12,0.05}=3.4903$，$F_{3,40,0.05}=2.8387$， $F_{3,40,0.025}=3.4633$，

$z_{0.025}=1.96$，$z_{0.05}=1.645$，$z_{0.01}=2.33$，$z_{0.005}=2.575$，$t_{28,0.025}=2.0484$，

$t_{29,0.025}=2.0452$，$t_{30,0.025}=2.0426$。*K-S* 檢定值，$D_{10,0.05}=0.409$，$D_{9,0.05}=0.43$，$D_{9,0.1}=0.387$。

一、 選擇題(每題 4 分，共 40 分)

1. A, B, and C, in that order, toss a die. The first one to toss a six wins. What is the probability that one of them will win in the first round?
   A. 1/216 B. 91/216 C. 1/2 D. 5/9 E. 1.0

2. Data were collected on the price of a certain DVD player, model ST300, at 7 stores. The mean price is $210 and the median is $205. The prices at 5 of these stores are given below: 215 200 190 230 185. What is the z-score of the $185 prices?
   A. –2.3682 B. –1.7450 C. –0.8103 D. –1.1574 E. –2.5972

3. In simple regression model, when the population slope is zero if and only if the population _____ is zero.
   A. Variance B. mean C. error D. correlation coefficient E. residual coefficient

4. Consider the hypotheses about a binomial population:
   $H_0: p \le .10$ v.s. $H_a: p > .10$ (hint: $\sqrt{50}=7.071$)
   Suppose the decision rule based on a random sample of size 50, is to reject H_0 if a sample proportion is greater than .20. What is the near probability of making Type I error? A. .050 B. .100 C. .043 D. .015 E. .001

5. A market research analyst would like to estimate the average weekly household expenditure on groceries in Stat City to within $5. The market research analyst is aware that weekly household expenditures on groceries are approximately normal and range from $50 to $160. What sample size would be necessary to be 99% confident?
   A. 82 B. 201 C. 117 D. 176 E. 232

（背面仍有題目，請繼續作答）

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6. The hourly wages of a sample of 130 system analysts are given below.
mean = 60, range = 20, mode = 73, variance = 324, median = 74. The coefficient of variation equals
A. 0.30% B. 30% C. 5.4% D. 54% E. 0.54%

(hint: $\sqrt{60}$ =7.746, $\sqrt{130}$ =11.402, $\sqrt{324}$ =18, $\sqrt{20}$ =4.472, $\sqrt{74}$ =8.602)

7. Doubling the size of the sample will
A. reduce the standard error of the mean to one-half its current value
B. reduce the standard error of the mean to approximately 70% of its current value
C. have no effect on the standard error of the mean
D. double the standard error of the mean
E. reduce the standard error of the mean to one-third its current value

8. A sample of 20 cans of tomato juice showed a standard deviation of 0.4 ounces. A 95% confidence interval estimate of the variance for the population is A. 0.2313 to 0.8533 B . 0.2224 to 0.7924
C. 0.0889 to 0.3169 D. 0.0925 to 0.3413 E. 0.2114 to 0.8952

9. Larger values of r^2 imply that the observations are more closely grouped about the
A . average value of the independent variables B. average value of the dependent variable
C. least squares line D. origin E. none of the above

10. The following information regarding a dependent variable Y and an independent variable X is provided $\Sigma X = 90$,
$\Sigma(Y-\overline{Y})(X-\overline{X}) = -156$, $\Sigma Y = 340$, $\Sigma(X-\overline{X})^2 = 234$, $n = 4$, $\Sigma(Y-\overline{Y})^2 = 1974$, SSR = 104.
MSE (mean square error) equals to A . 1870 B . 13 C . 1974 D. 233.75 E. 935

二、計算題(共 60 分) 【*能計算出來，就儘量算出，否則列出最簡化的式子。*】

1. 有一組隨機樣本（x_1, y_1）、（x_2, y_2）、…（x_{30}, y_{30}），計算得

$\hat{y} = -3.42 + 0.98x = b_0 + b_1 x$ ， $\sum_{i=1}^{30}(x_i - \bar{x})^2 = 6.38$ $\sum_{i=1}^{30}(y_i - \hat{y}_i)^2 = 0.86$。試求

（1）y 與 x 之相關係數。（5 分）

（2）β_1 之 95%信賴區間。（10 分）

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2. 若 X 與 Y 之聯合機率密度函數為 $f(x,y) = x^2 + xy/3,\ 0 < x < 1,\quad 0 < y < 2.$

（1）求 $P(Y < X) =$？（7 分）

（2）求 $P(Y < 1/2 \mid X < 1/2) =$？（8 分）

3. 從某一母體抽出一組資料如下：3.6, 8.5, 4.3, 5.2, 6.7, 2.1, 5.6, 9.4, 4.7, 1.3. 在顯著水準 $\alpha =$ 0.05，試說明此組資料是否是從均勻分配 U(0, 10)抽出？（15 分）

4. 王研究員想研究 3 種廠牌的咖啡的口味是否有顯著差異，找的六位品評員做測試，每位都隨機次序品嚐這 3 種廠牌的咖啡，評分結果如下：

品評員	1	2	3	4	5	6	$\bar{x}_i$	s
廠牌 A	8	7	4	5	7	6	6.17	1.472
廠牌 B	5	3	4	4	3	4	3.83	0.753
廠牌 C	4	6	3	2	5	1	3.5	1.871

若對廠牌 A、B 及 C 評分，是服從常態分配，且變異數都相等。在 α=0.05 ，試問廠牌 A、B 及 C 評分是否有相同的平均數？（15 分） $\sum_{i,j}(x_{i,j} - \bar{x})^2 = 56.5$