# 國立臺北大學106學年度碩士班一般入學考試試題

系（所）組別：國際企業研究所

科　　目：統計學



☑可 ☐不可 使用計算機

**A. 填充題:**

1. A financial advisor is considering three possible economic scenarios for the coming year and has developed a probability distribution showing the return of stock A in x and the return of stock B in y as below. The correlation of x and y is _____. (10%)

| Scenario | f(x,y) | x | y |
|---|---|---|---|
| Recession | 0.5 | 30 | 50 |
| Stable growth | 0.3 | 40 | 60 |
| Strong growth | 0.2 | 50 | 80 |

2. Businesspeople are interrupted at the rate of 10 times per hour. Suppose that number of interruptions follows a Poisson probability distribution. The probability that 6 or more minutes between interruptions is _____. (10%)

3. A research organization wishes to determine whether four brands of batteries for transistor radios perform equally well. Three batteries of each type were randomly selected and installed in three test radios. The partial ANOVA table is given below.

| **Source of Variation** | **Sum of Squares** | ***df*** |
|---|---|---|
| Treatment | 198 | 3 |
| Block | 248 | 2 |
| Error | 52 | 6 |

We first consider the three different test radios as blocks and the value of F test statistic is _____. (5%)

Now we ignore the block effect and the value of F test statistic is _____. (5%)

4. Suppose that each of two investments for a portfolio has a 4% chance of a loss of $10 million, a 6% chance of a loss of $1 million, and 90% chance of a gain of $1 million. They are independent of each other. The one percentile of investment return for this portfolio is _____. (10%)

5. A shareholders' group, in lodging a protest, claimed that the mean tenure for a chief executive officer was at least nine years. A survey of companies reported in The Wall Street Journal found a sample mean tenure of 7.75 years for 64 companies and the population standard deviation is assumed to be 4 years. With 0.05 level of significance $(Z_{0.05}=1.645,\ Z_{0.025}=1.96)$, the probability of making a Type II error when the mean tenure is 7.1975 years is _____. (10%)

**B. 計算論述題**

1. Let $X_1$ and $X_2$ have the joint probability mass function $p(x_1,x_2)=x_1x_2/36,\ x_1=1,2,3,$ and $x_2=1,2,3,$ zero elsewhere. Find first the joint probability mass function of $Y_1=X_1X_2$ and $Y_2=X_2$, and then find the marginal probability mass function of $Y_1$. (10%)

2. Let the random variables $X_1$ and $X_2$ have the joint probability density function $f(x_1,x_2)=\frac{1}{\pi}$ for $(x_1-1)^2+(x_2+2)^2<1$, zero elsewhere. Are $X_1$ and $X_2$ independent? Find the marginal probability density function of $X_1$. (10%)

3. In a regression analysis involving 30 observations, the following estimated regression equation was obtained.

   $\hat{y} = 17.6 + 3.8x_1 - 2.3x_2 + 7.6x_3 + 2.7x_4$

   For this estimated regression equation SST=1805 and SSR=1760.

   (a) At $\alpha = 0.05$, test the significance of the relationship among the variables. (10%)

   (b) Suppose variables $x_1$ and $x_4$ are dropped from the model and the following estimated regression equation is obtained.

   $\hat{y} = 11.1 - 3.6x_2 + 8.1x_3$

   For this model SSR=1705. Use an $F$ test and a 0.05 level of significance to determine whether $x_1$ and $x_4$ contribute significantly to the model. (10%)

4. The following data are from matched samples taken from two populations.

| | **Population** | |
|---|---|---|
| **Element** | **1** | **2** |
| 1 | 11 | 8 |
| 2 | 7 | 8 |
| 3 | 9 | 6 |
| 4 | 12 | 7 |
| 5 | 13 | 10 |
| 6 | 15 | 15 |
| 7 | 15 | 14 |

Provide a 95% confidence interval for the difference between the two population means. (10%)

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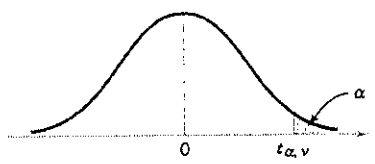
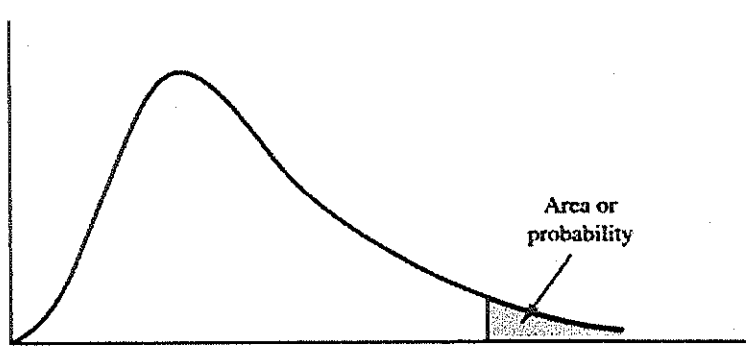



Table IV Percentage Points $t_{\alpha,\nu}$ of the $t$-Distribution

| ν \ α | .40 | .25 | .10 | .05 | .025 | .01 | .005 | .0025 | .001 | .0005 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .325 | 1.000 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 | 127.32 | 318.31 | 636.62 |
| 2 | .289 | .816 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 14.089 | 23.326 | 31.598 |
| 3 | .277 | .765 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 7.453 | 10.213 | 12.924 |
| 4 | .271 | .741 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 5.598 | 7.173 | 8.610 |
| 5 | .267 | .727 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 4.773 | 5.893 | 6.869 |
| 6 | .265 | .718 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 4.317 | 5.208 | 5.959 |
| 7 | .263 | .711 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 4.029 | 4.785 | 5.408 |
| 8 | .262 | .706 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 3.833 | 4.501 | 5.041 |
| 9 | .261 | .703 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 3.690 | 4.297 | 4.781 |
| 10 | .260 | .700 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 3.581 | 4.144 | 4.587 |
| 11 | .260 | .697 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 3.497 | 4.025 | 4.437 |
| 12 | .259 | .695 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 3.428 | 3.930 | 4.318 |
| 13 | .259 | .694 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 3.372 | 3.852 | 4.221 |
| 14 | .258 | .692 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 3.326 | 3.787 | 4.140 |




Entries in the table give $F_a$ values, where $a$ is the area or probability in the upper tail of the $F$ distribution.

| Denominator Degrees of Freedom | Area in Upper Tail | Numerator Degrees of Freedom | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 6 | 7 | 8 | 9 | 10 | 15 | 20 | 25 | 30 |
| 1 | .10 | 57.24 | 58.20 | 58.91 | 59.44 | 59.86 | 60.19 | 61.22 | 61.74 | 62.05 | 62.26 |
| | .05 | 230.16 | 233.99 | 236.77 | 238.88 | 240.54 | 241.88 | 245.95 | 248.02 | 249.26 | 250.10 |
| | .025 | 921.83 | 937.11 | 948.20 | 956.64 | 963.28 | 968.63 | 984.87 | 993.08 | 998.09 | 1001.40 |
| | .01 | 5763.96 | 5858.95 | 5928.33 | 5980.95 | 6022.40 | 6055.93 | 6156.97 | 6208.66 | 6239.86 | 6260.35 |
| 2 | .10 | 9.29 | 9.33 | 9.35 | 9.37 | 9.38 | 9.39 | 9.42 | 9.44 | 9.45 | 9.46 |
| | .05 | 19.30 | 19.33 | 19.35 | 19.37 | 19.38 | 19.40 | 19.43 | 19.45 | 19.46 | 19.46 |
| | .025 | 39.30 | 39.33 | 39.36 | 39.37 | 39.39 | 39.40 | 39.43 | 39.45 | 39.46 | 39.46 |
| | .01 | 99.30 | 99.33 | 99.36 | 99.38 | 99.39 | 99.40 | 99.43 | 99.45 | 99.46 | 99.47 |
| 3 | .10 | 5.31 | 5.28 | 5.27 | 5.25 | 5.24 | 5.23 | 5.20 | 5.18 | 5.17 | 5.17 |
| | .05 | 9.01 | 8.94 | 8.89 | 8.85 | 8.81 | 8.79 | 8.70 | 8.66 | 8.63 | 8.62 |
| | .025 | 14.88 | 14.73 | 14.62 | 14.54 | 14.47 | 14.42 | 14.25 | 14.17 | 14.12 | 14.08 |
| | .01 | 28.24 | 27.91 | 27.67 | 27.49 | 27.34 | 27.23 | 26.87 | 26.69 | 26.58 | 26.50 |
| 4 | .10 | 4.05 | 4.01 | 3.98 | 3.95 | 3.94 | 3.92 | 3.87 | 3.84 | 3.83 | 3.82 |
| | .05 | 6.26 | 6.16 | 6.09 | 6.04 | 6.00 | 5.96 | 5.86 | 5.80 | 5.77 | 5.75 |
| | .025 | 9.36 | 9.20 | 9.07 | 8.98 | 8.90 | 8.84 | 8.66 | 8.56 | 8.50 | 8.46 |
| | .01 | 15.52 | 15.21 | 14.98 | 14.80 | 14.66 | 14.55 | 14.20 | 14.02 | 13.91 | 13.84 |
| 5 | .10 | 3.45 | 3.40 | 3.37 | 3.34 | 3.32 | 3.30 | 3.324 | 3.21 | 3.19 | 3.17 |
| | .05 | 5.05 | 4.95 | 4.88 | 4.82 | 4.77 | 4.74 | 4.62 | 4.56 | 4.52 | 4.50 |
| | .025 | 7.15 | 6.98 | 6.85 | 6.76 | 6.68 | 6.62 | 6.43 | 6.33 | 6.27 | 6.23 |
| | .01 | 10.97 | 10.67 | 10.46 | 10.29 | 10.16 | 10.05 | 9.72 | 9.55 | 9.45 | 9.38 |

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