| 考試科目 | 統計方法 | 系所別 | 統計學系 | 考試時間 | 2 月 5 日(五) 第四節 |
|---|---|---|---|---|---|

***Note: Use the level of significance 0.05 for the test of hypothesis if required.***

1. (35%) Ten gulf players hit each a drive with one of three driver designs, namely A, B, and C, in a randomly selected order, and the overall distance (in yard) was recorded. The following table shows the result by player.

| Player | Design | | |
|---|---|---|---|
| | A | B | C |
| 1 | 306 | 323 | 320 |
| 2 | 279 | 313 | 289 |
| 3 | 293 | 318 | 314 |
| 4 | 277 | 288 | 282 |
| 5 | 281 | 286 | 287 |
| 6 | 272 | 312 | 283 |
| 7 | 297 | 326 | 332 |
| 8 | 271 | 306 | 284 |
| 9 | 279 | 325 | 294 |
| 10 | 323 | 319 | 289 |
| * $\sum Y_i$ | **2878** | **3116** | **2974** |
| ** $\sum Y_i^2$ | **830820** | **972804** | **887336** |

***denotes the sum of observations**

**** denotes the sum of squared observations**

Assume that overall distance follows a normal distribution. Answer the following questions.

(a) Construct a 95% confidence interval for the mean driving distance using design A. (6%)

(b) Test the equality of the population variances of driving distance between designs A and B. (7%)

(c) Test the equality of the population means of driving distance between designs A and B. (10%)

(d) If the total sum of squares is 10125.87, then test whether the mean driving distance is the same for all three designs. (12%)

2. (35%) We now consider a regression analysis for the same data in Question 1 by employing the overall distance as the response variable, and defining the following dummy variables as explanatory variables:

$$D_1 = \begin{cases} 1 & \text{if from Design B} \\ 0 & \text{otherwise} \end{cases}, \quad D_2 = \begin{cases} 1 & \text{if from Design C} \\ 0 & \text{otherwise} \end{cases}.$$

| 考試科目 | 統計方法 | 系所別 | 統計學系 | 考試時間 | 2 月 5 日(五) 第四節 |
|---|---|---|---|---|---|

We then obtain the following regression result.

| | Standard error |
|---|---|
| ***Constant*** | 5.185 |
| $D_1$ | 7.333 |
| $D_2$ | 7.333 |

Please answer the following questions.

(a) Write a linear regression model with both $D_1$ and $D_2$ to fit these data, explain each of the terms, and state the assumptions necessary for the model. (8%)

(b) Find the coefficient estimates of *constant*, $D_1$, and $D_2$. (6%)

(c) Explain the meanings of the estimated coefficients for $D_1$ and $D_2$. (6%)

(d) Show the significances of the coefficient estimates for $D_1$ and $D_2$. (8%)

(e) What is the value of the adjusted $R^2$? (7%)

3. (20%) A salesperson makes four calls per day. A sample of 100 days gives the following frequencies (days) of sales volumes.

| Number of sales | Days |
|---|---|
| 0 | 30 |
| 1 | 32 |
| 2 | 25 |
| 3 | 10 |
| 4 | 3 |

Assuming independent sales calls, the number of successful sales per day should follow a binomial distribution and the sales rate resulted from 30% of all sales calls. Use the goodness of fit test to determinant whether the assumption of a binomial probability distribution should be rejected.

4. (10%) One of the most common tests for the detection of prostate cancer is the prostate-specific antigen (PSA) test. Suppose there is a 0.23 probability that a male patient has prostate cancer before testing. The probability of a false-positive (tests that come back positive for cancer when no cancer is present) for the SPA test is 0.65, and the probability of a false-negative (no indication of cancer when cancer is actually present) is 0.18.

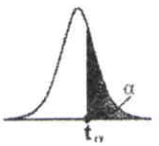
| 考試科目 | 統計方法 | 系所別 | 統計學系 | 考試時間 | 2 月 5 日(五) 第四節 |
|---|---|---|---|---|---|

(a) What is the probability that the male patient has prostate cancer if the PSA test comes back negative? (5%)

(b) What is the probability that the male patient has prostate cancer if the PSA test comes back positive? (5%)

**Percentage Points of the *t* Distribution; $t_{\nu,\alpha}$**

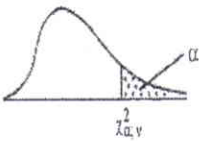
$P(T > t_{\nu,\alpha}) = \alpha$




| | α | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ν | 0.40 | 0.30 | 0.20 | 0.15 | 0.10 | 0.05 | 0.025 | 0.02 | 0.015 | 0.01 | 0.0075 | 0.005 | 0.0025 | 0.0005 |
| 1 | 0.325 | 0.727 | 1.376 | 1.963 | 3.078 | 6.314 | 12.706 | 15.895 | 21.205 | 31.821 | 42.434 | 63.657 | 127.322 | 636.590 |
| 2 | 0.289 | 0.617 | 1.061 | 1.386 | 1.886 | 2.920 | 4.303 | 4.849 | 5.643 | 6.965 | 8.073 | 9.925 | 14.089 | 31.598 |
| 3 | 0.277 | 0.584 | 0.978 | 1.250 | 1.638 | 2.353 | 3.182 | 3.482 | 3.896 | 4.541 | 5.047 | 5.841 | 7.453 | 12.924 |
| 4 | 0.271 | 0.569 | 0.941 | 1.190 | 1.533 | 2.132 | 2.776 | 2.999 | 3.298 | 3.747 | 4.088 | 4.604 | 5.598 | 8.610 |
| 5 | 0.267 | 0.559 | 0.920 | 1.156 | 1.476 | 2.015 | 2.571 | 2.757 | 3.003 | 3.365 | 3.634 | 4.032 | 4.773 | 6.869 |
| 6 | 0.265 | 0.553 | 0.906 | 1.134 | 1.440 | 1.943 | 2.447 | 2.612 | 2.829 | 3.143 | 3.372 | 3.707 | 4.317 | 5.959 |
| 7 | 0.263 | 0.549 | 0.896 | 1.119 | 1.415 | 1.895 | 2.365 | 2.517 | 2.715 | 2.998 | 3.203 | 3.499 | 4.029 | 5.408 |
| 8 | 0.262 | 0.546 | 0.889 | 1.108 | 1.397 | 1.860 | 2.306 | 2.449 | 2.634 | 2.896 | 3.085 | 3.355 | 3.833 | 5.041 |
| 9 | 0.261 | 0.543 | 0.883 | 1.100 | 1.383 | 1.833 | 2.262 | 2.398 | 2.574 | 2.821 | 2.998 | 3.250 | 3.690 | 4.781 |
| 10 | 0.260 | 0.542 | 0.879 | 1.093 | 1.372 | 1.812 | 2.228 | 2.359 | 2.527 | 2.764 | 2.932 | 3.169 | 3.581 | 4.587 |
| 11 | 0.260 | 0.540 | 0.876 | 1.088 | 1.363 | 1.796 | 2.201 | 2.328 | 2.491 | 2.718 | 2.879 | 3.106 | 3.497 | 4.437 |
| 12 | 0.259 | 0.539 | 0.873 | 1.083 | 1.356 | 1.782 | 2.179 | 2.303 | 2.461 | 2.681 | 2.836 | 3.055 | 3.428 | 4.318 |
| 13 | 0.259 | 0.538 | 0.870 | 1.079 | 1.350 | 1.771 | 2.160 | 2.282 | 2.436 | 2.650 | 2.801 | 3.012 | 3.372 | 4.221 |
| 14 | 0.258 | 0.537 | 0.868 | 1.076 | 1.345 | 1.761 | 2.145 | 2.264 | 2.415 | 2.624 | 2.771 | 2.977 | 3.326 | 4.140 |
| 15 | 0.258 | 0.536 | 0.866 | 1.074 | 1.341 | 1.753 | 2.131 | 2.249 | 2.397 | 2.602 | 2.746 | 2.947 | 3.286 | 4.073 |
| 16 | 0.258 | 0.535 | 0.865 | 1.071 | 1.337 | 1.746 | 2.120 | 2.235 | 2.382 | 2.583 | 2.724 | 2.921 | 3.252 | 4.015 |
| 17 | 0.257 | 0.534 | 0.863 | 1.069 | 1.333 | 1.740 | 2.110 | 2.224 | 2.368 | 2.567 | 2.706 | 2.898 | 3.222 | 3.965 |
| 18 | 0.257 | 0.534 | 0.862 | 1.067 | 1.330 | 1.734 | 2.101 | 2.214 | 2.356 | 2.552 | 2.689 | 2.878 | 3.197 | 3.922 |
| 19 | 0.257 | 0.533 | 0.861 | 1.066 | 1.328 | 1.729 | 2.093 | 2.205 | 2.346 | 2.539 | 2.674 | 2.861 | 3.174 | 3.883 |
| 20 | 0.257 | 0.533 | 0.860 | 1.064 | 1.325 | 1.725 | 2.086 | 2.197 | 2.336 | 2.528 | 2.661 | 2.845 | 3.153 | 3.850 |
| 21 | 0.257 | 0.532 | 0.859 | 1.063 | 1.323 | 1.721 | 2.080 | 2.189 | 2.328 | 2.518 | 2.649 | 2.831 | 3.135 | 3.819 |
| 22 | 0.256 | 0.532 | 0.858 | 1.061 | 1.321 | 1.717 | 2.074 | 2.183 | 2.320 | 2.508 | 2.639 | 2.819 | 3.119 | 3.792 |
| 23 | 0.256 | 0.532 | 0.858 | 1.060 | 1.319 | 1.714 | 2.069 | 2.177 | 2.313 | 2.500 | 2.629 | 2.807 | 3.104 | 3.768 |
| 24 | 0.256 | 0.531 | 0.857 | 1.059 | 1.318 | 1.711 | 2.064 | 2.172 | 2.307 | 2.492 | 2.620 | 2.797 | 3.091 | 3.745 |
| 25 | 0.256 | 0.531 | 0.856 | 1.058 | 1.316 | 1.708 | 2.060 | 2.167 | 2.301 | 2.485 | 2.612 | 2.787 | 3.078 | 3.725 |
| 26 | 0.256 | 0.531 | 0.856 | 1.058 | 1.315 | 1.706 | 2.056 | 2.162 | 2.296 | 2.479 | 2.605 | 2.779 | 3.067 | 3.707 |
| 27 | 0.256 | 0.531 | 0.855 | 1.057 | 1.314 | 1.703 | 2.052 | 2.158 | 2.291 | 2.473 | 2.598 | 2.771 | 3.057 | 3.690 |
| 28 | 0.256 | 0.530 | 0.855 | 1.056 | 1.313 | 1.701 | 2.048 | 2.154 | 2.286 | 2.467 | 2.592 | 2.763 | 3.047 | 3.674 |
| 29 | 0.256 | 0.530 | 0.854 | 1.055 | 1.311 | 1.699 | 2.045 | 2.150 | 2.282 | 2.462 | 2.586 | 2.756 | 3.038 | 3.659 |
| 30 | 0.256 | 0.530 | 0.854 | 1.055 | 1.310 | 1.697 | 2.042 | 2.147 | 2.278 | 2.457 | 2.581 | 2.750 | 3.030 | 3.646 |
| 40 | 0.255 | 0.529 | 0.851 | 1.050 | 1.303 | 1.684 | 2.021 | 2.123 | 2.250 | 2.423 | 2.542 | 2.704 | 2.971 | 3.551 |
| 60 | 0.254 | 0.527 | 0.848 | 1.045 | 1.296 | 1.671 | 2.000 | 2.099 | 2.223 | 2.390 | 2.504 | 2.660 | 2.915 | 3.460 |
| 120 | 0.254 | 0.526 | 0.845 | 1.041 | 1.289 | 1.658 | 1.980 | 2.076 | 2.196 | 2.358 | 2.468 | 2.617 | 2.860 | 3.373 |
| ∞ | 0.253 | 0.524 | 0.842 | 1.036 | 1.282 | 1.645 | 1.960 | 2.054 | 2.170 | 2.326 | 2.432 | 2.576 | 2.807 | 3.291 |

| 考試科目 | 統計方法 | 系所別 | 統計學系 | 考試時間 | 2月 5日(五) 第四節 |
|---|---|---|---|---|---|

## Table of the Chi-square Distribution




| α = | 0.995 | 0.99 | 0.98 | 0.975 | 0.95 | 0.90 | 0.80 | 0.20 | 0.10 | 0.05 | 0.025 | 0.02 | 0.01 | 0.005 | 0.001 | =α |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v = 1 | 0.0000393 | 0.000157 | 0.000628 | 0.000982 | 0.00393 | 0.0158 | 0.0642 | 1.642 | 2.706 | 3.841 | 5.024 | 5.412 | 6.635 | 7.879 | 10.827 | v = 1 |
| 2 | 0.0100 | 0.0201 | 0.0404 | 0.0506 | 0.103 | 0.211 | 0.446 | 3.219 | 4.605 | 5.991 | 7.378 | 7.824 | 9.210 | 10.597 | 13.815 | 2 |
| 3 | 0.0717 | 0.115 | 0.185 | 0.216 | 0.352 | 0.584 | 1.005 | 4.642 | 6.251 | 7.815 | 9.348 | 9.837 | 11.345 | 12.838 | 16.268 | 3 |
| 4 | 0.207 | 0.297 | 0.429 | 0.484 | 0.711 | 1.064 | 1.649 | 5.989 | 7.779 | 9.488 | 11.143 | 11.668 | 13.277 | 14.860 | 18.465 | 4 |
| 5 | 0.412 | 0.554 | 0.752 | 0.831 | 1.145 | 1.610 | 2.343 | 7.289 | 9.236 | 11.070 | 12.832 | 13.388 | 15.086 | 16.750 | 20.517 | 5 |
| 6 | 0.676 | 0.872 | 1.134 | 1.237 | 1.635 | 2.204 | 3.070 | 8.558 | 10.645 | 12.592 | 14.449 | 15.033 | 16.812 | 18.548 | 22.457 | 6 |
| 7 | 0.989 | 1.239 | 1.564 | 1.690 | 2.167 | 2.833 | 3.822 | 9.803 | 12.017 | 14.067 | 16.013 | 16.622 | 18.475 | 20.278 | 24.322 | 7 |
| 8 | 1.344 | 1.646 | 2.032 | 2.180 | 2.733 | 3.490 | 4.594 | 11.030 | 13.362 | 15.507 | 17.535 | 18.168 | 20.090 | 21.955 | 26.125 | 8 |
| 9 | 1.735 | 2.088 | 2.532 | 2.700 | 3.325 | 4.168 | 5.380 | 12.242 | 14.684 | 16.919 | 19.023 | 19.679 | 21.666 | 23.589 | 27.877 | 9 |
| 10 | 2.156 | 2.558 | 3.059 | 3.247 | 3.940 | 4.865 | 6.179 | 13.442 | 15.987 | 18.307 | 20.483 | 21.161 | 23.209 | 25.188 | 29.588 | 10 |
| 11 | 2.603 | 3.053 | 3.609 | 3.816 | 4.575 | 5.578 | 6.989 | 14.631 | 17.275 | 19.675 | 21.920 | 22.618 | 24.725 | 26.757 | 31.264 | 11 |
| 12 | 3.074 | 3.571 | 4.178 | 4.404 | 5.226 | 6.304 | 7.807 | 15.812 | 18.549 | 21.026 | 23.337 | 24.054 | 26.217 | 28.300 | 32.909 | 12 |
| 13 | 3.565 | 4.107 | 4.765 | 5.009 | 5.892 | 7.042 | 8.634 | 16.985 | 19.812 | 22.362 | 24.736 | 25.472 | 27.688 | 29.819 | 34.528 | 13 |
| 14 | 4.075 | 4.660 | 5.368 | 5.629 | 6.571 | 7.790 | 9.467 | 18.151 | 21.064 | 23.685 | 26.119 | 26.873 | 29.141 | 31.319 | 36.123 | 14 |
| 15 | 4.601 | 5.229 | 5.985 | 6.262 | 7.261 | 8.547 | 10.307 | 19.311 | 22.307 | 24.996 | 27.488 | 28.259 | 30.578 | 32.801 | 37.697 | 15 |
| 16 | 5.142 | 5.812 | 6.614 | 6.908 | 7.962 | 9.312 | 11.152 | 20.465 | 23.542 | 26.296 | 28.845 | 29.633 | 32.000 | 34.267 | 39.252 | 16 |
| 17 | 5.697 | 6.408 | 7.255 | 7.564 | 8.672 | 10.085 | 12.002 | 21.615 | 24.769 | 27.587 | 30.191 | 30.995 | 33.409 | 35.718 | 40.790 | 17 |
| 18 | 6.265 | 7.015 | 7.906 | 8.231 | 9.390 | 10.865 | 12.857 | 22.760 | 25.989 | 28.869 | 31.526 | 32.346 | 34.805 | 37.156 | 42.312 | 18 |
| 19 | 6.844 | 7.633 | 8.567 | 8.907 | 10.117 | 11.651 | 13.716 | 23.900 | 27.204 | 30.144 | 32.852 | 33.687 | 36.191 | 38.582 | 43.820 | 19 |
| 20 | 7.434 | 8.260 | 9.237 | 9.591 | 10.851 | 12.443 | 14.578 | 25.038 | 28.412 | 31.410 | 34.170 | 35.020 | 37.566 | 39.997 | 45.315 | 20 |
| 21 | 8.034 | 8.897 | 9.915 | 10.283 | 11.591 | 13.240 | 15.445 | 26.171 | 29.615 | 32.671 | 35.479 | 36.343 | 38.932 | 41.401 | 46.797 | 21 |
| 22 | 8.643 | 9.542 | 10.600 | 10.982 | 12.338 | 14.041 | 16.314 | 27.301 | 30.813 | 33.924 | 36.781 | 37.659 | 40.289 | 42.796 | 48.268 | 22 |
| 23 | 9.260 | 10.196 | 11.293 | 11.688 | 13.091 | 14.848 | 17.187 | 28.429 | 32.007 | 35.172 | 38.076 | 38.968 | 41.638 | 44.181 | 49.728 | 23 |
| 24 | 9.886 | 10.856 | 11.992 | 12.401 | 13.848 | 15.659 | 18.062 | 29.553 | 33.196 | 36.415 | 39.364 | 40.270 | 42.980 | 45.558 | 51.179 | 24 |
| 25 | 10.520 | 11.524 | 12.697 | 13.120 | 14.611 | 16.473 | 18.940 | 30.675 | 34.382 | 37.652 | 40.646 | 41.566 | 44.314 | 46.928 | 52.620 | 25 |
| 26 | 11.160 | 12.198 | 13.409 | 13.844 | 15.379 | 17.292 | 19.820 | 31.795 | 35.563 | 38.885 | 41.923 | 42.856 | 45.642 | 48.290 | 54.052 | 26 |
| 27 | 11.808 | 12.879 | 14.125 | 14.573 | 16.151 | 18.114 | 20.703 | 32.912 | 36.741 | 40.113 | 43.194 | 44.140 | 46.963 | 49.645 | 55.476 | 27 |
| 28 | 12.461 | 13.565 | 14.847 | 15.308 | 16.928 | 18.939 | 21.588 | 34.027 | 37.916 | 41.337 | 44.461 | 45.419 | 48.278 | 50.993 | 56.893 | 28 |
| 29 | 13.121 | 14.256 | 15.574 | 16.047 | 17.708 | 19.768 | 22.475 | 35.139 | 39.087 | 42.557 | 45.722 | 46.693 | 49.588 | 52.336 | 58.302 | 29 |
| 30 | 13.787 | 14.953 | 16.306 | 16.791 | 18.493 | 20.599 | 23.364 | 36.250 | 40.256 | 43.773 | 46.979 | 47.962 | 50.892 | 53.672 | 59.703 | 30 |
| 40 | 20.706 | 22.164 | 23.838 | 24.433 | 26.509 | 29.051 | 32.345 | 47.269 | 51.805 | 55.759 | 59.342 | 60.436 | 63.691 | 66.766 | 73.402 | 40 |
| 50 | 27.991 | 29.707 | 31.664 | 32.357 | 34.764 | 37.689 | 41.449 | 58.164 | 63.167 | 67.505 | 71.420 | 72.613 | 76.154 | 79.490 | 86.661 | 50 |
| 60 | 35.535 | 37.485 | 39.699 | 40.482 | 43.188 | 46.459 | 50.641 | 68.972 | 74.397 | 79.082 | 83.298 | 84.580 | 88.379 | 91.952 | 99.607 | 60 |
| 70 | 43.275 | 45.442 | 47.893 | 48.758 | 51.739 | 55.329 | 59.898 | 79.715 | 85.527 | 90.531 | 95.023 | 96.388 | 100.425 | 104.215 | 112.317 | 70 |
| 80 | 51.171 | 53.539 | 56.213 | 57.153 | 60.391 | 64.278 | 69.207 | 90.405 | 96.578 | 101.880 | 106.629 | 108.069 | 112.329 | 116.321 | 124.839 | 80 |
| 90 | 59.196 | 61.754 | 64.634 | 65.646 | 69.126 | 73.291 | 78.558 | 101.054 | 107.565 | 113.145 | 118.136 | 119.648 | 124.116 | 128.299 | 137.208 | 90 |
| 100 | 67.327 | 70.065 | 73.142 | 74.222 | 77.929 | 82.358 | 87.945 | 111.667 | 118.498 | 124.342 | 129.561 | 131.142 | 135.807 | 140.170 | 149.449 | 100 |

| 考試科目 | 統計方法 | 系所別 | 統計學系 | 考試時間 | 2月5日(五)第四節 |
|---|---|---|---|---|---|

## F - Distribution ($\alpha = 0.05$ in the Right Tail)

| $df_2$ \ $df_1$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| | Numerator Degrees of Freedom | | | | | | | | |
| 1 | 161.45 | 199.50 | 215.71 | 224.58 | 230.16 | 233.99 | 236.77 | 238.88 | 240.54 |
| 2 | 18.513 | 19.000 | 19.164 | 19.247 | 19.296 | 19.330 | 19.353 | 19.371 | 19.385 |
| 3 | 10.128 | 9.5521 | 9.2766 | 9.1172 | 9.0135 | 8.9406 | 8.8867 | 8.8452 | 8.8123 |
| 4 | 7.7086 | 9.9443 | 6.5914 | 6.3882 | 6.2561 | 6.1631 | 6.0942 | 6.0410 | 6.9988 |
| 5 | 6.6079 | 5.7861 | 5.4095 | 5.1922 | 5.0503 | 4.9503 | 4.8759 | 4.8183 | 4.7725 |
| 6 | 5.9874 | 5.1433 | 4.7571 | 4.5337 | 4.3874 | 4.2839 | 4.2067 | 4.1468 | 4.0990 |
| 7 | 5.5914 | 4.7374 | 4.3468 | 4.1203 | 3.9715 | 3.8660 | 3.7870 | 3.7257 | 3.6767 |
| 8 | 5.3177 | 4.4590 | 4.0662 | 3.8379 | 3.6875 | 3.5806 | 3.5005 | 3.4381 | 3.3881 |
| 9 | 5.1174 | 4.2565 | 3.8625 | 3.6331 | 3.4817 | 3.3738 | 3.2927 | 3.2296 | 3.1789 |
| 10 | 4.9646 | 4.1028 | 3.7083 | 3.4780 | 3.3258 | 3.2172 | 3.1355 | 3.0717 | 3.0204 |
| 11 | 4.8443 | 3.9823 | 3.5874 | 3.3567 | 3.2039 | 3.0946 | 3.0123 | 2.9480 | 2.8962 |
| 12 | 4.7472 | 3.8853 | 3.4903 | 3.2592 | 3.1059 | 2.9961 | 2.9134 | 2.8486 | 2.7964 |
| 13 | 4.6672 | 3.8056 | 3.4105 | 3.1791 | 3.0254 | 2.9153 | 2.8321 | 2.7669 | 2.7144 |
| 14 | 4.6001 | 3.7389 | 3.3439 | 3.1122 | 2.9582 | 2.8477 | 2.7642 | 2.6987 | 2.6458 |
| 15 | 4.5431 | 3.6823 | 3.2874 | 3.0556 | 2.9013 | 2.7905 | 2.7066 | 2.6408 | 2.5876 |
| 16 | 4.4940 | 3.6337 | 3.2389 | 3.0069 | 2.8524 | 2.7413 | 2.6572 | 2.5911 | 2.5377 |
| 17 | 4.4513 | 3.5915 | 3.1968 | 2.9647 | 2.8100 | 2.6987 | 2.6143 | 2.5480 | 2.4943 |
| 18 | 4.4139 | 3.5546 | 3.1599 | 2.9277 | 2.7729 | 2.6613 | 2.5767 | 2.5102 | 2.4563 |
| 19 | 4.3807 | 3.5219 | 3.1274 | 2.8951 | 2.7401 | 2.6283 | 2.5435 | 2.4768 | 2.4227 |
| 20 | 4.3512 | 3.4928 | 3.0984 | 2.8661 | 2.7109 | 2.5990 | 2.5140 | 2.4471 | 2.3928 |
| 21 | 4.3248 | 3.4668 | 3.0725 | 2.8401 | 2.6848 | 2.5727 | 2.4876 | 2.4205 | 2.3660 |
| 22 | 4.3009 | 3.4434 | 3.0491 | 2.8167 | 2.6613 | 2.5491 | 2.4638 | 2.3965 | 2.3419 |
| 23 | 4.2793 | 3.4221 | 3.0280 | 2.7955 | 2.6400 | 2.5277 | 2.4422 | 2.3748 | 2.3201 |
| 24 | 4.2597 | 3.4028 | 3.0088 | 2.7763 | 2.6207 | 2.5082 | 2.4226 | 2.3551 | 2.3002 |
| 25 | 4.2417 | 3.3852 | 2.9912 | 2.7587 | 2.6030 | 2.4904 | 2.4047 | 2.3371 | 2.2821 |
| 26 | 4.2252 | 3.3690 | 2.9752 | 2.7426 | 2.5868 | 2.4741 | 2.3883 | 2.3205 | 2.2655 |
| 27 | 4.2100 | 3.3541 | 2.9604 | 2.7278 | 2.5719 | 2.4591 | 2.3732 | 2.3053 | 2.2501 |
| 28 | 4.1960 | 3.3404 | 2.9467 | 2.7141 | 2.5581 | 2.4453 | 2.3593 | 2.2913 | 2.2360 |
| 29 | 4.1830 | 3.3277 | 2.9340 | 2.7014 | 2.5454 | 2.4324 | 2.3463 | 2.2783 | 2.2229 |
| 30 | 4.1709 | 3.3158 | 2.9223 | 2.6896 | 2.5336 | 2.4205 | 2.3343 | 2.2662 | 2.2107 |
| 40 | 4.0847 | 3.2317 | 2.8387 | 2.6060 | 2.4495 | 2.3359 | 2.2490 | 2.1802 | 2.1240 |
| 60 | 4.0012 | 3.1504 | 2.7581 | 2.5252 | 2.3683 | 2.2541 | 2.1665 | 2.0970 | 2.0401 |
| 120 | 3.9201 | 3.0718 | 2.6802 | 2.4472 | 2.2899 | 2.1750 | 2.0868 | 2.0164 | 1.9588 |
| ∞ | 3.8415 | 2.9957 | 2.6049 | 2.3719 | 2.2141 | 2.0986 | 2.0096 | 1.9384 | 1.8799 |

Denominator Degrees of Freedom

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
|---|---|

| 考試科目 | 統計方法 | 系所別 | 統計學系 | 考試時間 | 2 月 5 日（五）第 四 節 |
|---|---|---|---|---|---|

## F - Distribution ($\alpha = 0.025$ in the Right Tail)

| $df_2$ \ $df_1$ | Numerator Degrees of Freedom | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Denominator Degrees of Freedom | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 647.79 | 799.50 | 864.16 | 899.58 | 921.85 | 937.11 | 948.22 | 956.66 | 963.28 |
| 2 | 38.506 | 39.000 | 39.165 | 39.248 | 39.298 | 39.331 | 39.335 | 39.373 | 39.387 |
| 3 | 17.443 | 16.044 | 15.439 | 15.101 | 14.885 | 14.735 | 14.624 | 14.540 | 14.473 |
| 4 | 12.218 | 10.649 | 9.9792 | 9.6045 | 9.3645 | 9.1973 | 9.0741 | 8.9796 | 8.9047 |
| 5 | 10.007 | 8.4336 | 7.7636 | 7.3879 | 7.1464 | 6.9777 | 6.8531 | 6.7572 | 6.6811 |
| 6 | 8.8131 | 7.2599 | 6.5988 | 6.2272 | 5.9876 | 5.8198 | 5.6955 | 5.5996 | 5.5234 |
| 7 | 8.0727 | 6.5415 | 5.8898 | 5.5226 | 5.2852 | 5.1186 | 4.9949 | 4.8993 | 4.8232 |
| 8 | 7.5709 | 6.0595 | 5.4160 | 5.0526 | 4.8173 | 4.6517 | 4.5286 | 4.4333 | 4.3572 |
| 9 | 7.2093 | 5.7147 | 5.0781 | 4.7181 | 4.4844 | 4.3197 | 4.1970 | 4.1020 | 4.0260 |
| 10 | 6.9367 | 5.4564 | 4.8256 | 4.4683 | 4.2361 | 4.0721 | 3.9498 | 3.8549 | 3.7790 |
| 11 | 6.7241 | 5.2559 | 4.6300 | 4.2751 | 4.0440 | 3.8807 | 3.7586 | 3.6638 | 3.5879 |
| 12 | 6.5538 | 5.0959 | 4.4742 | 4.1212 | 3.8911 | 3.7283 | 3.6065 | 3.5118 | 3.4358 |
| 13 | 6.4143 | 4.9653 | 4.3472 | 3.9959 | 3.7667 | 3.6043 | 3.4827 | 3.3880 | 3.3120 |
| 14 | 6.2979 | 4.8567 | 4.2417 | 3.8919 | 3.6634 | 3.5014 | 3.3799 | 3.2853 | 3.2093 |
| 15 | 6.1995 | 4.7650 | 4.1528 | 3.8043 | 3.5764 | 3.4147 | 3.2934 | 3.1987 | 3.1227 |
| 16 | 6.1151 | 4.6867 | 4.0768 | 3.7294 | 3.5021 | 3.3406 | 3.2194 | 3.1248 | 3.0488 |
| 17 | 6.0420 | 4.6189 | 4.0112 | 3.6648 | 3.4379 | 3.2767 | 3.1556 | 3.0610 | 2.9849 |
| 18 | 5.9781 | 4.5597 | 3.9539 | 3.6083 | 3.3820 | 3.2209 | 3.0999 | 3.0053 | 2.9291 |
| 19 | 5.9216 | 4.5075 | 3.9034 | 3.5587 | 3.3327 | 3.1718 | 3.0509 | 2.9563 | 2.8801 |
| 20 | 5.8715 | 4.4613 | 3.8587 | 3.5147 | 3.2891 | 3.1283 | 3.0074 | 2.9128 | 2.8365 |
| 21 | 5.8266 | 4.4199 | 3.8188 | 3.4754 | 3.2501 | 3.0895 | 2.9686 | 2.8740 | 2.7977 |
| 22 | 5.7863 | 4.3828 | 3.7829 | 3.4401 | 3.2151 | 3.0546 | 2.9338 | 2.8392 | 2.7628 |
| 23 | 5.7498 | 4.3492 | 3.7505 | 3.4083 | 3.1835 | 3.0232 | 2.9023 | 2.8077 | 2.7313 |
| 24 | 5.7166 | 4.3187 | 3.7211 | 3.3794 | 3.1548 | 2.9946 | 2.8738 | 2.7791 | 2.7027 |
| 25 | 5.6864 | 4.2909 | 3.6943 | 3.3530 | 3.1287 | 2.9685 | 2.8478 | 2.7531 | 2.6766 |
| 26 | 5.6586 | 4.2655 | 3.6697 | 3.3289 | 3.1048 | 2.9447 | 2.8240 | 2.7293 | 2.6528 |
| 27 | 5.6331 | 4.2421 | 3.6472 | 3.3067 | 3.0828 | 2.9228 | 2.8021 | 2.7074 | 2.6309 |
| 28 | 5.6096 | 4.2205 | 3.6264 | 3.2863 | 3.0626 | 2.9027 | 2.7820 | 2.6872 | 2.6106 |
| 29 | 5.5878 | 4.2006 | 3.6072 | 3.2674 | 3.0438 | 2.8840 | 2.7633 | 2.6686 | 2.5919 |
| 30 | 5.5675 | 4.1821 | 3.5894 | 3.2499 | 3.0265 | 2.8667 | 2.7460 | 2.6513 | 2.5746 |
| 40 | 5.4239 | 4.0510 | 3.4633 | 3.1261 | 2.9037 | 2.7444 | 2.6238 | 2.5289 | 2.4519 |
| 60 | 5.2856 | 3.9253 | 3.3425 | 3.0077 | 2.7863 | 2.6274 | 2.5068 | 2.4117 | 2.3344 |
| 120 | 5.1523 | 3.8046 | 3.2269 | 2.8943 | 2.6740 | 2.5154 | 2.3948 | 2.2994 | 2.2217 |
| ∞ | 5.0239 | 3.6889 | 3.1161 | 2.7858 | 2.5665 | 2.4082 | 2.2875 | 2.1918 | 2.1136 |

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
|---|---|