

# 亞洲大學

## 101 學年度博士班入學招生考試試題紙

| 學系別                    | 考試科目    | 考試日期      | 時 間         |
|------------------------|---------|-----------|-------------|
| 健康產業管理學系(健康管理組)<br>博士班 | 統計學 (C) | 101.04.14 | 10:40-12:20 |

### Part A 選擇題 (10% per question)

1. A consumer group does a test of package delivery times by the postal service from A city to B city. A sample of 16 packages has a mean delivery time of 3.8 days with a standard deviation of 1.6. If the postal service claims packages will reach their destinations in 3 or fewer days, can this claim be rejected at the 5% level of significance?  
(1) Yes, reject the postal service claim. (2) No, do not reject the postal service claim. (3) Yes, reject the alternative hypothesis. (4) No, do not accept the alternative hypothesis.
2. According to question 1, what is the range of the p value used in this decision?  
(1)  $0.25 < p < 0.5$  (2)  $0.01 < p < 0.025$  (3)  $0.025 < p < 0.05$  (4)  $0.05 < p < 0.1$
3. A manufacturer wants to be 99% sure that his error margin of the mean weight of the product is 0.125 pounds. What sample size is necessary if the standard deviation is 0.5?  
(1) 49 (2) 54 (3) 59 (4) 107
4. A random sample of 64 college students gives a mean weight of 140 pounds and a standard deviation of 16 pound. What's approximate 95.4% error margin?  
(1) 5 pounds (2) 4 pounds (3) 8 pounds (4) 10 pounds
5. In a linear regression model, which one in the following is an unbiased estimator of  $\sigma^2$ ?  
(1) MSE (2) SSE (3) MSB (4) SST
6. What is the degree of freedom for the answer of question 5? (Denote k as the number of independent variables.)  
(1) N-1 (2) N-k-1 (3) N-k (4) k-1

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7. In a simple linear regression model which modeling the relationship between a response  $Y$  and an independent variable  $X$ , the regression coefficients were estimated at  $\beta_0 = 5$ ,  $\beta_1 = 8$ . What is the mean of  $Y$  with  $X = 10$  ?

- (1) 75 (2) 80 (3) 85 (4) 90

8. Tom selects a random sample of size 36 from population A and computes a 95% confidence interval for the mean. Sally takes a random sample of size 49, also from population A, and computes a 95% confidence interval for the mean. Which confidence interval will have the larger half-width?

- (1) Tom's interval (2) Sally's interval (3) cannot tell from the information (4) none of the above

### Part B 簡答題 (10% per question)

To understand whether smoking is a risk factor of prostate cancer, 30 patients with prostate cancer and 30 healthy subjects without prostate cancer were enrolled in a study. According to the self-report result, 15 of those patients and 10 of those healthy subjects were current smokers.

1. Can we estimate the risk of prostate cancer for a current smoker? If yes, what is it? If no, why not?
2. How will you judge whether smoking is a risk factor of prostate cancer? Write down your answers step by step without calculation.

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附表 1 Standard normal cumulative probabilities

| <i>z</i> | 0.00   | 0.01   | 0.02   | 0.03   | 0.04   | 0.05   | 0.06   | 0.07   | 0.08   | 0.09   |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| -3.8     | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| -3.7     | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| -3.6     | 0.0002 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| -3.5     | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 |
| -3.4     | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0002 |
| -3.3     | 0.0005 | 0.0005 | 0.0005 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0003 |
| -3.2     | 0.0007 | 0.0007 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0005 | 0.0005 | 0.0005 |
| -3.1     | 0.0010 | 0.0009 | 0.0009 | 0.0009 | 0.0008 | 0.0008 | 0.0008 | 0.0008 | 0.0007 | 0.0007 |
| -3.0     | 0.0014 | 0.0013 | 0.0013 | 0.0012 | 0.0012 | 0.0011 | 0.0011 | 0.0011 | 0.0010 | 0.0010 |
| -2.9     | 0.0019 | 0.0018 | 0.0018 | 0.0017 | 0.0016 | 0.0016 | 0.0015 | 0.0015 | 0.0014 | 0.0014 |
| -2.8     | 0.0026 | 0.0025 | 0.0024 | 0.0023 | 0.0023 | 0.0022 | 0.0021 | 0.0021 | 0.0020 | 0.0019 |
| -2.7     | 0.0035 | 0.0034 | 0.0033 | 0.0032 | 0.0031 | 0.0030 | 0.0029 | 0.0028 | 0.0027 | 0.0026 |
| -2.6     | 0.0047 | 0.0045 | 0.0044 | 0.0043 | 0.0041 | 0.0040 | 0.0039 | 0.0038 | 0.0037 | 0.0036 |
| -2.5     | 0.0062 | 0.0060 | 0.0059 | 0.0057 | 0.0055 | 0.0054 | 0.0052 | 0.0051 | 0.0049 | 0.0048 |
| -2.4     | 0.0082 | 0.0080 | 0.0078 | 0.0076 | 0.0073 | 0.0071 | 0.0069 | 0.0068 | 0.0066 | 0.0064 |
| -2.3     | 0.0107 | 0.0104 | 0.0102 | 0.0099 | 0.0096 | 0.0094 | 0.0091 | 0.0089 | 0.0087 | 0.0084 |
| -2.2     | 0.0139 | 0.0136 | 0.0132 | 0.0129 | 0.0125 | 0.0122 | 0.0119 | 0.0116 | 0.0113 | 0.0110 |
| -2.1     | 0.0179 | 0.0174 | 0.0170 | 0.0166 | 0.0162 | 0.0158 | 0.0154 | 0.0150 | 0.0146 | 0.0143 |
| -2.0     | 0.0228 | 0.0222 | 0.0217 | 0.0212 | 0.0207 | 0.0202 | 0.0197 | 0.0192 | 0.0188 | 0.0183 |
| -1.9     | 0.0287 | 0.0281 | 0.0274 | 0.0268 | 0.0262 | 0.0256 | 0.0250 | 0.0244 | 0.0239 | 0.0233 |
| -1.8     | 0.0359 | 0.0351 | 0.0344 | 0.0336 | 0.0329 | 0.0322 | 0.0314 | 0.0307 | 0.0301 | 0.0294 |
| -1.7     | 0.0446 | 0.0436 | 0.0427 | 0.0418 | 0.0409 | 0.0401 | 0.0392 | 0.0384 | 0.0375 | 0.0367 |
| -1.6     | 0.0548 | 0.0537 | 0.0526 | 0.0516 | 0.0505 | 0.0495 | 0.0485 | 0.0475 | 0.0465 | 0.0455 |
| -1.5     | 0.0668 | 0.0655 | 0.0643 | 0.0630 | 0.0618 | 0.0606 | 0.0594 | 0.0582 | 0.0571 | 0.0559 |
| -1.4     | 0.0808 | 0.0793 | 0.0778 | 0.0764 | 0.0749 | 0.0735 | 0.0721 | 0.0708 | 0.0694 | 0.0681 |
| -1.3     | 0.0968 | 0.0951 | 0.0934 | 0.0918 | 0.0901 | 0.0885 | 0.0869 | 0.0853 | 0.0838 | 0.0823 |
| -1.2     | 0.1151 | 0.1131 | 0.1112 | 0.1093 | 0.1075 | 0.1057 | 0.1038 | 0.1020 | 0.1003 | 0.0985 |
| -1.1     | 0.1357 | 0.1335 | 0.1314 | 0.1292 | 0.1271 | 0.1251 | 0.1230 | 0.1210 | 0.1190 | 0.1170 |
| -1.0     | 0.1587 | 0.1562 | 0.1539 | 0.1515 | 0.1492 | 0.1469 | 0.1446 | 0.1423 | 0.1401 | 0.1379 |
| -0.9     | 0.1841 | 0.1814 | 0.1788 | 0.1762 | 0.1736 | 0.1711 | 0.1685 | 0.1660 | 0.1635 | 0.1611 |
| -0.8     | 0.2119 | 0.2090 | 0.2061 | 0.2033 | 0.2005 | 0.1977 | 0.1949 | 0.1922 | 0.1894 | 0.1867 |
| -0.7     | 0.2420 | 0.2389 | 0.2358 | 0.2327 | 0.2297 | 0.2266 | 0.2236 | 0.2206 | 0.2177 | 0.2148 |
| -0.6     | 0.2743 | 0.2709 | 0.2676 | 0.2643 | 0.2611 | 0.2578 | 0.2546 | 0.2514 | 0.2483 | 0.2451 |
| -0.5     | 0.3085 | 0.3050 | 0.3015 | 0.2981 | 0.2946 | 0.2912 | 0.2877 | 0.2843 | 0.2810 | 0.2776 |
| -0.4     | 0.3446 | 0.3409 | 0.3372 | 0.3336 | 0.3300 | 0.3264 | 0.3228 | 0.3192 | 0.3156 | 0.3121 |
| -0.3     | 0.3821 | 0.3783 | 0.3745 | 0.3707 | 0.3669 | 0.3632 | 0.3594 | 0.3557 | 0.3520 | 0.3483 |
| -0.2     | 0.4207 | 0.4168 | 0.4129 | 0.4090 | 0.4052 | 0.4013 | 0.3974 | 0.3936 | 0.3897 | 0.3859 |
| -0.1     | 0.4602 | 0.4562 | 0.4522 | 0.4483 | 0.4443 | 0.4404 | 0.4364 | 0.4325 | 0.4286 | 0.4247 |
| -0.0     | 0.5000 | 0.4960 | 0.4920 | 0.4880 | 0.4840 | 0.4801 | 0.4761 | 0.4721 | 0.4681 | 0.4641 |

Note: Table entry is the area under the standard normal curve to the left of the indicated *z*-value, thus giving  $P(Z < z)$ .

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附表 2

| Percentiles of the chi-square distribution |       |       |       |       |       |
|--|-------|-------|-------|-------|-------|
| Area in Upper Tail                         |       |       |       |       |       |
| df   | 0.100 | 0.050 | 0.025 | 0.010 | 0.001 |
| 1  | 2.71  | 3.84  | 5.02  | 6.63  | 10.83 |
| 2  | 4.61  | 5.99  | 7.38  | 9.21  | 13.82 |
| 3  | 6.25  | 7.81  | 9.35  | 11.34 | 16.27 |
| 4  | 7.78  | 9.49  | 11.14 | 13.28 | 18.47 |
| 5  | 9.24  | 11.07 | 12.83 | 15.09 | 20.52 |

附表 3

Percentiles of the  $t$  distribution

| Area in Upper Tail |       |       |        |        |        |         |
|--------------------|-------|-------|--------|--------|--------|---------|
| df                 | 0.10  | 0.05  | 0.025  | 0.01   | 0.005  | 0.0005  |
| 1                  | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 | 636.619 |
| 2                  | 1.886 | 2.920 | 4.303  | 6.965  | 9.925  | 31.599  |
| 3                  | 1.638 | 2.353 | 3.182  | 4.541  | 5.841  | 12.924  |
| 4                  | 1.533 | 2.132 | 2.776  | 3.747  | 4.604  | 8.610   |
| 5                  | 1.476 | 2.015 | 2.571  | 3.365  | 4.032  | 6.869   |
| 6                  | 1.440 | 1.943 | 2.447  | 3.143  | 3.707  | 5.959   |
| 7                  | 1.415 | 1.895 | 2.365  | 2.998  | 3.499  | 5.408   |
| 8                  | 1.397 | 1.860 | 2.306  | 2.896  | 3.355  | 5.041   |
| 9                  | 1.383 | 1.833 | 2.262  | 2.821  | 3.250  | 4.781   |
| 10                 | 1.372 | 1.812 | 2.228  | 2.764  | 3.169  | 4.587   |
| 11                 | 1.363 | 1.796 | 2.201  | 2.718  | 3.106  | 4.437   |
| 12                 | 1.356 | 1.782 | 2.179  | 2.681  | 3.055  | 4.318   |
| 13                 | 1.350 | 1.771 | 2.160  | 2.650  | 3.012  | 4.221   |
| 14                 | 1.345 | 1.761 | 2.145  | 2.624  | 2.977  | 4.140   |
| 15                 | 1.341 | 1.753 | 2.131  | 2.602  | 2.947  | 4.073   |
| 16                 | 1.337 | 1.746 | 2.120  | 2.583  | 2.921  | 4.015   |
| 17                 | 1.333 | 1.740 | 2.110  | 2.567  | 2.898  | 3.965   |
| 18                 | 1.330 | 1.734 | 2.101  | 2.552  | 2.878  | 3.922   |
| 19                 | 1.328 | 1.729 | 2.093  | 2.539  | 2.861  | 3.883   |
| 20                 | 1.325 | 1.725 | 2.086  | 2.528  | 2.845  | 3.850   |