

國立臺北大學 113 學年度碩士班一般入學考試試題

系（所）組別：都市計劃研究所甲組、乙組
科 目：統計學

第1頁 共4頁
☒可 ☐不可使用計算機

1. (25%) An urban planning expert would like to understand the need of the public transportation in a residential area. A questionnaire is designed to collect the residents' opinions. The question in the questionnaire includes basic demographic variables, the type of public transportation and the willingness to pay fare (unit: NT dollar). The basic demographic variables include gender, age (unit: year) and type of jobs and years of education. Exploratory data analysis (EDA) is an important statistical analysis procedure. Data visualization is one of the EDA.

The commonly used statistical figures include

(A) Bar chart	(B) Box plot	(C) Histogram	(D) Line chart (折線圖)
(E) Pie chart	(F) QQ plot	(G) Scatter plot	

Use the letters (A) – (G) to answer the following questions. **Multiple** figures might be possible for the following questions.

- (i) Write down the appropriate figures for visualizing the willingness to pay fare.
 - (ii) Write down the appropriate figures for visualizing gender.
 - (iii) Write down the appropriate figures for visualizing the type of jobs.
 - (iv) Write down the appropriate figures for visualizing sex and willingness to pay fare.
 - (v) Write down the appropriate figures for visualizing age and willing to pay.
2. (25%) An urban planning expert would like to understand the need of the public transportation in a residential area. A questionnaire is designed to collect the residents' opinions. The question in the questionnaire includes basic demographic variables, the type of public transportation and the willing to pay fare (unit: NT dollar). The basic demographic variables include gender, age (unit: year) and type of jobs and years of education. Exploratory data analysis (EDA) is an important statistical analysis procedure. The following provides the commonly used summary statistics.

(A) Correlation	(B) Frequency	(C) Interquartile	(D) Kurtosis
(E) Mean	(F) Medium	(G) Minimum	(H) Mode
(I) Percent	(J) Skewness	(K) Standard deviation	(L) Variance

Use the letters (A) – (L) to answer the following questions. **Multiple** summary statistics might be possible for the following questions.

- (i) Write down the appropriate summary statistics for the type of jobs.
- (ii) Write down the appropriate summary statistics for describing the central tendency of the willingness to pay fare.
- (iii) Write down the appropriate summary statistics for describing the variability of the willingness to pay fare.
- (iv) Write down the appropriate summary statistics for describing the shape of the distribution of the willingness to pay fare.
- (v) Write down the appropriate summary statistics for summarizing the association between the age and the willingness to pay fare.

國立臺北大學 113 學年度碩士班一般入學考試試題

系（所）組別：都市計劃研究所甲組、乙組
科 目：統計學

第2頁 共4頁
☒可 ☐不可使用計算機

3. (15%) An urban planning expert would like to understand the need of the public transportation in a residential area. A questionnaire is designed to collect the residents' opinions. The question in the questionnaire includes basic demographic variables, the type of public transportation and the willing to pay fare (unit: NT dollar). The basic demographic variables include gender, age (unit: year) and type of jobs and years of education. Exploratory data analysis (EDA) is an important statistical analysis procedure. The following provides common used test statistics:

(A) Chi-square test	(B) Correlation	(C) McNemar test	(D) One-Way Analysis of Variance (ANOVA)
(E) Paired T test	(F) Simple linear regression	(G) Two independent sample T test	(H) Wilcoxon rank sum test

Use the letters (A) – (H) to answer the following questions. **Multiple** test statistics might be possible for the following questions.

- (i) Write down the appropriate test statistics for testing the association between the willingness to pay fare and gender.
 - (ii) Write down the appropriate test statistics for testing the association between the willingness to pay fare and age.
 - (iii) Write down the appropriate test statistics for testing the type of public transportation and gender.
4. (10%) Let X denote the willingness to pay fare. Assume that the distribution of X approximately follows a normal distribution with mean 25 NT dollars and standard deviation 2 NT dollars.
- (i) Find the probability that the willingness to pay fare exceeds 28 NT dollars.
 - (ii) Assume the expert would like to know the reasonable willingness to pay fare. The expert would like to collect a sample data to estimate the mean housing price μ . Assume the standard deviation equals 2 NT dollars. How large a sample is necessary if he want the estimate to be within 0.25 NT dollar of the actual mean value μ , with 95% confidence?
5. (15%) Assume the target fare equals 25 NT dollars. Suppose a sample of size 25 residents are asked and assume the probability that the residents would be willing to pay more 27 NT dollars equal 0.1. Let X equal the number of residents who are willing to pay more than 27 NT dollars.
- (i) Find $P[X = 1]$.
 - (ii) Find the probability that no residents are willing to pay more than 27 NT dollars.
 - (iii) Find mean and variance of X .
6. (10%) The urban planning expert expects that there exists a gender difference in willingness to pay fare. Assume that the fare between female and male are normally distributed. Let the sample mean and sample deviation of the willingness to pay fare for female and male be

	n	Sample mean	Sample standard deviation
Female	25	26.85	1.11
Male	25	25.00	1.02

Assume that the variance of the fare are roughly equal between female and male.

- (i) Write down the hypotheses. The proper notation should be used.
- (ii) Use a 5% significance level to make your inference.

國立臺北大學 113 學年度碩士班一般入學考試試題

系（所）組別：都市計劃研究所甲組、乙組
科 目：統計學

第3頁 共4頁
☒可 ☐不可使用計算機

Table 1 : Area under the standard normal curve

z	P[Z ≤ z]									
	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.00	0.50	0.50	0.50	0.51	0.51	0.51	0.52	0.52	0.53	0.53
0.10	0.53	0.54	0.54	0.55	0.55	0.55	0.56	0.56	0.57	0.57
0.20	0.57	0.58	0.58	0.59	0.59	0.59	0.60	0.60	0.61	0.61
0.30	0.61	0.62	0.62	0.62	0.63	0.63	0.64	0.64	0.64	0.65
0.40	0.65	0.65	0.66	0.66	0.67	0.67	0.67	0.68	0.68	0.68
0.50	0.69	0.69	0.69	0.70	0.70	0.70	0.71	0.71	0.71	0.72
0.60	0.72	0.72	0.73	0.73	0.73	0.74	0.74	0.74	0.75	0.75
0.70	0.75	0.76	0.76	0.76	0.77	0.77	0.77	0.77	0.78	0.78
0.80	0.78	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.81	0.81
0.90	0.81	0.81	0.82	0.82	0.82	0.82	0.83	0.83	0.83	0.83
1.00	0.84	0.84	0.84	0.84	0.85	0.85	0.85	0.85	0.85	0.86
1.10	0.86	0.86	0.86	0.87	0.87	0.87	0.87	0.87	0.88	0.88
1.20	0.88	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90
1.30	0.90	0.90	0.90	0.90	0.90	0.91	0.91	0.91	0.91	0.91
1.40	0.91	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93
1.50	0.93	0.93	0.93	0.93	0.93	0.93	0.94	0.94	0.94	0.94
1.60	0.94	0.94	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95
1.70	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.96	0.96	0.96
1.80	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.97
1.90	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
2.00	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.98	0.98	0.98
2.10	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
2.20	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
2.30	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.99
2.40	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
2.50	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
2.60	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
2.70	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
2.80	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
2.90	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
3.00	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99

國立臺北大學 113 學年度碩士班一般入學考試試題

系（所）組別：都市計劃研究所甲組、乙組
科 目：統計學

第4頁 共4頁
☒可 ☐不可使用計算機

Table 2 : Selected quantiles of the t distribution

	$P[T \leq t]$				
r	0.900	0.950	0.975	0.99	0.995
1	3.08	6.31	12.71	31.82	63.66
2	1.89	2.92	4.30	6.96	9.92
3	1.64	2.35	3.18	4.54	5.84
4	1.53	2.13	2.78	3.75	4.60
5	1.48	2.02	2.57	3.36	4.03
6	1.44	1.94	2.45	3.14	3.71
7	1.41	1.89	2.36	3.00	3.50
8	1.40	1.86	2.31	2.90	3.36
9	1.38	1.83	2.26	2.82	3.25
10	1.37	1.81	2.23	2.76	3.17
11	1.36	1.80	2.20	2.72	3.11
12	1.36	1.78	2.18	2.68	3.05
13	1.35	1.77	2.16	2.65	3.01
14	1.35	1.76	2.14	2.62	2.98
15	1.34	1.75	2.13	2.60	2.95
16	1.34	1.75	2.12	2.58	2.92
17	1.33	1.74	2.11	2.57	2.90
18	1.33	1.73	2.10	2.55	2.88
19	1.33	1.73	2.09	2.54	2.86
20	1.33	1.72	2.09	2.53	2.85
21	1.32	1.72	2.08	2.52	2.83
22	1.32	1.72	2.07	2.51	2.82
23	1.32	1.71	2.07	2.50	2.81
24	1.32	1.71	2.06	2.49	2.80
25	1.32	1.71	2.06	2.49	2.79
26	1.31	1.71	2.06	2.48	2.78
27	1.31	1.70	2.05	2.47	2.77
28	1.31	1.70	2.05	2.47	2.76
29	1.31	1.70	2.05	2.46	2.76
30	1.31	1.70	2.04	2.46	2.75
40	1.30	1.68	2.02	2.43	2.70
60	1.30	1.67	2.00	2.39	2.66