國立中央大學 109 學年度碩士班考試入學試題

所別： 資訊管理學系 碩士班 丙組(一般生)　　共 6 頁　第 1 頁

科目： 統計學

本科考試禁用計算器　　＊請在答案卷(卡)內作答

Part I. Answer the multiple-choice questions bellow and write down your answer in the answer sheet. (20%)

Note: Please refer to Appendix for the standardized normal probabilities that you may need for the following questions.

1. In a criminal trial, a Type II error is made when: (5%)
   A. an innocent person is convicted.
   B. a guilty defendant is acquitted.
   C. a guilty defendant is convicted.
   D. an innocent person is acquitted.

2. Suppose that the following observations drawn from a normal population whose standard deviation is 10. Test with $\alpha = 0.01$ to determine whether there is enough evidence to conclude that the population mean differs from 25. (5%)

16	29	37	41	21	37	33	47	28	20

   A. Reject H_0.
   B. Do not reject H_0.
   C. Reject both H_0 and H_1.
   D. None of the above is correct.

參考用

注意：背面有試題

Context for questions 3-4

Suppose the president of the Republic of China (Taiwan) wants to estimate the proportion of the population that supports her current policy toward Anti-infiltration Law. The president wants the estimate to be within 0.04 of the true proportion. Assume a 95% level of confidence. The president's political advisors found a similar survey from two months ago that reported that 60% of people supported Anti-infiltration Law.

3. How large of a sample is required? (5%)
   A. 575.
   B. 576.
   C. 577.
   D. 578.

4. How large of a sample would be necessary if no estimate were available for the proportion supporting current policy? (5%)
   A. 600.
   B. 601.
   C. 602.
   D. None of the above is correct.

參考用

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Part II. Please write down your answer in the answer sheet. (80%)

Note: In case the given data are not enough to compute the result, you may use well-defined symbols to represent. Please provide all the calculations steps and answers should be clearly displayed.

5. A sample of 20 software company in Taoyuan City revealed the following earning per share for the year 2019.

5.4	4.6	3.5	2.8	2.6	5.5	5.5	2.3	3.2	4.2
4.0	3.0	3.6	4.5	4.7	4.2	3.3	3.2	4.2	3.4

A. Please determine the coefficient of skewness and interpret it. (5%)
B. Please determine the coefficient of kurtosis and interpret it. (5%)
C. Please construct a box plot to represent these data. (5%)

6. A marketing director regularly conducts a survey of consumer decision making. The results of the latest survey indicate that approximately 1 in 5 potential buyers of a product see the given advertising on Facebook, and 1 in 50 sees a corresponding YouTube video ad. One in 100 sees both. Of those who purchase the good, 1 in 10 without seeing any ads. One in 3 actually purchases the product after seeing the ad.

A. What is the probability that a randomly selected potential customer will purchase the product? (5%)
B. What is the probability that a randomly selected non-purchaser had never seen the ad? (5%)

7. The following density function describe the random variable X.

$$f(x) = \begin{cases} ax + bx^2, & 0 \le x \le 1 \\ 0, & otherwise \end{cases} \quad \text{with } \mu = {}^2/_3$$

A. Please find a and b. (5%)

B. Please find the standard deviation and median of X. (10%)

Six independent observations are made on this variable X.

C. What is the probability that at least four of the observations are greater than mean? (5%)

8. Automobiles arrive ate the Xinwu exit of Sun Yat-Sen Freeway at a mean rate of 20 per hour. The distribution of arrivals approximates a Poisson distribution.

A. What are the mean and variance of the waiting time for the fifth automobiles arrivals? (5%)

B. What is the probability that no automobiles arrive within three minutes? (5%)

9. Taiwanese consumers are increasingly viewing mobile payment as a convenient substitute for cash. The average amount spent annually on mobile payment is \$7,790. Assume that this average was based on a sample of 100 consumers and that the population standard deviation is \$500. (*round to two decimal places*)

A. A consumer advocate comments that the majority if consumers spend over \$8,000 on mobile payment. Determine whether this statement is true or false. (5%)

B. What is the interquartile range of this distribution? (5%)

C. Construct the 95% confidence interval for the population mean amount spent annually on mobile payment? (5%)

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10. Suppose the following statistics were calculated from data gathered from a randomized block experiment with five treatments and seven blocks. Please fill in the missing values in the following ANOVA Table. (*round to four decimal places*, 10%)

Source of Variation	*SS*	*df*	*MS*	*F*
Treatments		4		
Blocks	3,120	6		
Error			115	
Total	12,600	34		

參考用

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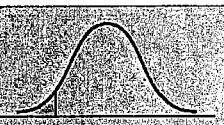
Appendix. Cumulative Standardized Normal Probabilities



$P(-\infty < Z < z)$

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.0	0.0013	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	0.0075	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	0.1056	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	0.2296	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

參考用

注意：背面有試題