科目名稱：統計學【資管系碩士班乙組】
※本科目依簡章規定「不可以」使用計算機(問答申論題)

請依照題號書寫答案，並標示清楚題號。下列表格為機率分佈之變數與機率值。最後答案請計算至小數點第二位。

α	.01	0.025	0.05
z_α	2.33	1.96	1.645
$t_\alpha(11)$	3.11	2.59	2.20
$t_\alpha(14)$	2.98	2.51	2.14
$t_\alpha(25)$	2.79	2.38	2.06
$t_\alpha(27)$	2.77	2.37	2.05
$\chi_\alpha^2(1)$	6.63	5.02	3.84
$\chi_\alpha^2(2)$	9.21	7.38	5.99
$\chi_\alpha^2(3)$	11.34	9.35	7.81
$\chi_\alpha^2(4)$	13.28	11.14	9.49
$F_\alpha(3,12)$	5.95	4.47	3.49
$F_\alpha(4,12)$	5.41	4.12	3.26

Note: $\alpha = P(z > z_\alpha)$

1. On average, one email comes in every 5 minutes for a customer service account. It is known that the number of emails follows the Poisson distribution. What is the probability that no more than 2 emails in 10 minutes? (15 分)

2. A consumer group wants to estimate the proportion of university students that have part-time jobs. Within the error of 3% with 90% confidence, how large the sample size is required? （15 分）

3. A particular brand of cookies comes in three different favors. Let A_1 = {vanilla}, A_2 = {chocolate}, A_3 = {berry}. Let p_i equal the probability that the favor of a piece of cookie selected at random belongs to A_i, i = 1, 2, 3. Given the significance level 0.05, test the null hypothesis

$$H_0 : p_1 = 0.4, \quad p_2 = 0.4, \quad p_3 = 0.2$$

using a random sample of n = 480 pieces of cookies whose favors yield the respective frequencies 212, 198, and 70. At the 0.05 level of significance, is there evidence to reject the null hypothesis? (20 分)

4. Independent random samples of the heights of adult males and females yielded the following results:

Males: n = 15, $\bar{x}$ = 175 cm, s_X = 6 cm;

Females: m = 12, $\bar{y}$ = 160 cm, s_Y = 5 cm.

At the 0.05 level of significance, is there evidence to reject the null hypothesis $H_0 : \mu_X \geq \mu_Y$? (20 分)

5. An advertising agency plans to test the effect of social media advertising on product perception. An experiment is designed to compare four different social media advertisements, A, B, C, D, each with different advertising approaches. The agency asks for 5 students to watch through all four advertisements and then rate each of them with ranges from 1 to 10. The scores for the 5 students are as follows. Give the

significance level of 0.05,

Internet Advertisements

Students	A	B	C	D
1	7	9	5	3
2	6	8	4	4
3	8	9	5	3
4	5	7	5	2
5	6	10	7	1

a. Is there evidence of a difference among the internet advertisements? (15 分)

b. Does the blocking have a significant effect in reducing the random error? (15 分)