國立中央大學97學年度碩士班考試入學試題卷

所別：企業管理學系碩士班　（丙、丁、辛組）　科目：統計學　共 / 頁　第 / 頁

＊請在試卷答案卷（卡）內作答

1. An industry, in deciding whether to purchase a machine of design A or design B, checks the times for completing a certain task on each machine. Eight technicians were used in the experiment, with each technician using both machine A and machine B in a randomized order. The times (in seconds) to completion of the task are given in the accompanying table.

Technician	1	2	3	4	5	6	7	8
A	32	40	42	26	35	29	45	22
B	30	39	42	23	36	27	41	21

(1) Do you think blocking on technician was worthwhile in this case? Explain. (5%)
(2) Test to see there is a significant blocking effect at the 5% significance level. (20%)

2. Suppose the relationship between applied stress x and time-to-failure Y is described by the simple linear regression model with true regression line $E(y) = 100 - 3.92x$ and $\sigma^2 = 2$. Let Y1 denotes an observation on time-to-failure made with x=15 and Y2 denotes an independent observation made with x=14, find the probability that Y1 exceed Y2, i.e., P{Y1 > Y2}=? (15%)

3. Consider the linear regression model $Y_i = b_0 + b_1 x_{1i} + b_2 x_{2i} + \varepsilon_i$ i=1, 2, …, n

Suppose we have the estimates $\overline{Y} = 10, s_y^2 = 4, \overline{x}_1 = 2, s_{x1}^2 = 1, \hat{b}_1 = 1.4$, n=20, then determine the *beta coefficient* of x_1 and explain its meaning. (15%)

4. As the items come to the end of production line, an inspector chooses which items are to go through a complete inspection. Ten percent of all items produced are defective. Sixty percent of all defective items go through a complete inspection, and 20% of all good items go through a complete inspection. Given that an item is completely inspected, what is the probability it is defective? (15%)

5. Consider the summary data of three treatments as following table:

Treatment	n_i	$\bar{x}_i$	s_i
1	10	4	1.0
2	10	6	1.5
3	10	2	0.5

Compute a 95% confidence interval for $\frac{1}{2}(\mu_1 + \mu_2) - \mu_3$ (20%)

6. Two types of defects, A and B, are seen in the output of a certain manufacturing process. Each item can be classified into one of the four classes AB, AB*, A*B, A*B*, where A* denote the absence of the type A defect. For 100 inspected items the following frequencies were observed: AB:48, AB*:18, A*B:21, A*B*:13. At 5% significance level, test the hypothesis that the four categories, in the order listed, occur in the ratio 5:2:2:1. (10%)

Normal distribution $P(Z \leq 1.645)=0.95$ $P(Z \leq 1.96)=0.975$ F distribution $F_{7,7,0.05} = 3.79$, $F_{7,8,0.05} = 3.50$

Chi-square distribution $\chi^2_{3,0.05} = 7.814$, $\chi^2_{4,0.05} = 9.487$ t distribution $t_{27,0.025} = 2.052$, $t_{27,0.05} = 1.703$, $t_{30,0.025} = 2.042$, $t_{30,0.05} = 1.697$