所別：營建管理研究所碩士班 不分組(一般生)　科目：工程經濟與統計　共 2 頁 第 1 頁
本科考試可使用計算器，廠牌、功能不拘　　　　　　　　　　　＊請在試卷答案卷（卡）內作答

I：工程統計（50分）

1. Short answer questions：（共20分）
   a. The two parameters to define a normal distribution? How does each of them affect the shape of the distribution? (5分)
   b. Management by six sigma? (5分)
   c. What is R^2? (5分)
   d. What is the 'Statistical hypothesis testing'? Please write three possible applications in engineering management? (5分)

2. 某瀝青道路路面鋪設工程全長2公里，假設該工程驗收總共須取樣5點，試分別以簡單隨機取樣（simple random sampling）、分層隨機取樣（stratified random sampling）及系統取樣（systematic sampling）等方法進行取樣（9分）。並比較三種方法優劣點（3分）。

3. The table below shows the concrete compression test results from project Z. What is the probability of the concrete compression strength smaller than 210kgf/cm2 ? What is the probability of the strength in between 240 and 280kgf/cm2 ?　If the design strength is 210kgf/cm2, are you satisfied? Why? （18分）

No.	Sampling Date	Sample ID	Sample 1	Sample 2
1	85.7.1	P5-1	246	260
2	85.7.1	P7-2	294	275
3	85.7.1	P3-1	305	290
4	85.7.2	P3-2	266	278
5	85.7.2	P4-1	224	242
6	85.7.2	P4-2	225	204
7	85.7.3	P6-1	177	169
8	85.7.3	P1-1	209	231
9	85.7.4	C1-1	257	243
10	85.7.4	C1-3	226	252
11	85.7.5	P8-1	313	310
12	85.7.5	S3-1	274	273
13	85.7.6	S3-2	243	248
14	85.7.6	S3-3	184	201

注意：背面有試題

II. 工程經濟 (50 分)

Mr. Seal would like to run a small business regarding fired chicken in a night market. He was taught to conduct a feasibility analysis before getting started. There are 3 types of necessary equipment for the business and the corresponding costs are:

Equipment R: This acquisition must go through a broker. The market price for a R is $1000 including 25% of broker's fee. However, he can waive the fee due to a promotion.

Equipment I: Mr. Seal can construct I himself. All he needs to do is to purchase and then assemble components including 10 As, 5 Bs, 20 Cs, and 10 Ds. The unit costs for A to D are $20, $30, $40, and $50, respectively.

Equipment S: This equipment is usually acquired using the lowest bid method. During the bidding process, there are 7 qualified bidders offering their prices of $550, $450, $770, $475, $680, $710 and $600.

After having the Equipment R, I, and S put together, Mr. Seal starts to estimate the most-likely cashflows shown in the following table.

Cashflows (actual dollars)						Study period
Initial investment ($)	Net cashflows ($)					
Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	
The initial investment is set to sum of Equip. R, I, and S, plus overhead of $100	500	500	1000	1500	2000	5 years

Assuming that the general price inflation rates (f) for the next 5 years are estimated to 0.96%, 1.94%, 1.94%, 2.94%, and 2.94%; the total price escalation rates (e) for the next 5 years are expected to 3.5%, 4%, 5%, 6%, and 8%; no salvage value is available for all alternatives; and the before-tax minimum attractive rate of return (MARR, or i_c) is set to 5%, please answer the following questions:

(a) Determine the initial investment for this small business (5pt).

(b) Compute all differential price inflation rates (e') and real interest rates (i_r) for these 5 years (5 pt).

(c) Develop the Before-Tax-Cash-Flows (BTCF) for this small business in real dollars. Determine if this business is practicable for Mr. Seal (10 pt).

(d) Compute the real dollar sensitivity analysis with these three factors of initial investment, net cashflows, and study period by ±20% deviation range (10 pt). When conducting sensitivity analysis on useful life, ignore the cashflow(s) if its corresponding period is deleted, or repeat the cashflow(s) according to the last year if its corresponding useful life is extended. Determine the sensitivity ranking for these three factors (5 pt).

(e) Exogenous factors may influence this business such as irrational violence by gangsters. Mr. Seal decides to adjust the MARR (i_c) from 5% to 20% because of such possible impact. Under the real dollar computation, find adjusted i_r (5 pt), calculate the project real dollars, and determine if the business is still sound (10 pt).

** To find Present value given Future value (P/F) at the first 5 years, discount rate:

	$i=2\%$	$i=3\%$	$i=4\%$	$i=5\%$	$i=6\%$	$i=7\%$	$i=8\%$	$i=10\%$	$i=15\%$	$i=20\%$
Year 1	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9091	.8696	.8333
Year 2	.9612	.9426	.9426	.9070	.8900	.8734	.8573	.8264	.7561	.6944
Year 3	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7513	.6575	.5787
Year 4	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.6830	.5718	.4823
Year 5	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6209	.4972	.4019

** To find Present value given Annuity (P/A) at the first 5 years discount rate:

	$i=2\%$	$i=3\%$	$i=4\%$	$i=5\%$	$i=6\%$	$i=7\%$	$i=8\%$	$i=10\%$	$i=15\%$	$i=20\%$
Year 1	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9091	0.8696	0.8333
Year 2	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7355	1.6257	1.5278
Year 3	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.4869	2.2832	2.1065
Year 4	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.1699	2.8550	2.5887
Year 5	4.7135	4.5797	1.4518	4.3295	4.2124	4.1002	3.9927	3.7908	3.3522	2.9906

注意：背面有試題