所別：營建管理研究所碩士班 不分組　科目：工程經濟與統計　共 2 頁 第 1 頁

＊請在試卷答案卷（卡）內作答

第一部份：工程統計（共五十分）

1. Short answer questions：（共 20 分）
   a. The two parameters to define a normal distribution? How do they each 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 'Statistical hypothesis testing'? Its possible applications in engineering management? (5 分)
2. 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?（15 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

3. 某工程業主單位統計其近年來已發包完工工程之資料如下，欄位 a 是決標價為底價之折扣數；欄位 b 是工程完工工期延展總天數與計畫工期比率；欄位 c 為工程超出決標價之總金額與決標價比率。根據此資料，試製作散佈圖，並論決標價折扣數與工期延展比率、以及與超出決標價之總金額比率之關聯性，結果與妳（你）的認知相符嗎？(15 分)

a (決標價/底價)	b (工期延展總天數/計畫工期)	c (超出決標價總金額/決標價)
0.74	1.40	0.15
0.78	1.38	0.12
0.65	1.50	0.18
0.95	1.10	0.02
0.88	1.12	0.03
0.76	1.30	0.12
0.69	1.35	0.18
0.92	1.07	0.01
0.85	1.05	0.01
0.72	1.22	0.09
0.82	1.06	0.06
0.85	1.03	0.10
0.78	1.10	0.12
0.74	1.20	0.18
0.76	1.26	0.15
0.82	1.06	0.02
0.91	1.10	0.03
0.94	1.02	0.05
0.88	1.11	0.08
0.64	1.37	0.12
0.68	1.42	0.15
0.70	1.38	0.09

第二部份：工程經濟（共五十分）

A college student wants to buy a motorcycle for his commute. He has narrowed all potentials down to only 3 motorcycles, or say, A, B, and C. Now he needs a solid financial analysis before making up his mind. Given that (i) the average monthly mileage for his commute is 1,000 km, (ii) current inflation rate at 5%** is assumedly equal to the discount rate, (iii) 1 liter gasoline is $30, and (iv) the time scale for cash-flow calculation is based on year, here comes info mation regarding these 3 motorcycles.

Motorcycle	Purchasing price	Cash flows	Salvage value	Serving mileage (km)
A	$50,000	• $100 lubricant costs for every 1000 km; • $300 maintenance costs for every 1000 km • $1000 overhaul costs for every 6000 km • Fuel consumption: 30km/l	$5000	48,000
B	$60,000	• $100 lubricant costs for every 1000 km; • $300 maintenance costs for every 2000 km • $1000 overhaul costs for every 12000 km • Fuel consumption: 40km/l	$10000	60,000
C	$70,000	• $100 lubricant costs for every 2000 km; • $300 maintenance costs for every 3000 km • $1000 overhaul costs for every 24000 km • Fuel consumption: 50km/l	$12000	72,000

** To find Future value given Present value (F/P) at 5% discount rate:

Period	1	2	3	4	5	6	7	8	9	10
F/P	1.0500	1.1025	1.1576	1.2155	1.2763	1.3401	1.4071	1.4775	1.5513	1.6289
Period	12	15	20	24	30	40	50	60	100	∞
F/P	1.7959	2.0789	2.6533	3.2251	4.3219	7.0400	11.4674	18.6792	131.5013	-

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

Period	1	2	3	4	5	6	7	8	9	10
P/A	0.9524	1.8594	2.7323	3.5460	4.3295	5.0757	5.7864	6.4632	7.1078	7.7217
Period	12	15	20	24	30	40	50	60	100	∞
P/A	8.8633	10.3797	12.4622	13.7986	15.3752	17.1591	18.2559	18.9293	19.8479	20.0000

Please answer the following questions:

(a) Please provide an assumption for this student use so as to compare these 3 alternatives (5%).

(b) Please draw the cash-flow diagrams for all motorcycles (10%).

(c) By using the future worth (FW) method and the assumption you provide in (a), please calculate all FW values for these 3 motorcycles (30%).

(d) Please rank the motorcycles and determine which one is the best choice (5%).