Q1-(a)

Expt. No.	Surface Defect			
	Test Wafer 3			
	Top	Center	Bottom	Eta
1	1	1	0	1.7609126
2	126	3	1	-37.23893
3	315	50	180	-46.50388
4	15	40	18	-28.55115
5	2020	360	13	-61.47178
6	2500	270	35	-63.23879
7	1800	720	315	-61.09199
8	9999	225	1	-75.23012
9	3000	2800	2000	-68.41776
10	1	0	1	1.7609126
11	1	0	1	1.7609126
12	270	8	3	-43.86041
13	225	3	0	-42.27321
14	63	15	39	-32.79895
15	1890	180	25	-60.79799
16	14	1	1	-18.19544
17	9999	600	8	-75.24353
18	5000	2000	2000	-70.41393

Expt. No.	Thickness					
	Test Wafer 3					
	Top	Center	Bottom	MU	sigma^2	Eta
1	1952	1941	1949	1947.3333	32.33333	50.6923
2	5323	5307	5091	5240.3333	16789.33	32.13684
3	6077	5943	5962	5994	5257	38.34696
4	2149	2130	2111	2130	361	40.99252
5	5031	5040	5032	5034.3333	24.33333	60.17682
6	2934	2875	2841	2883.3333	2214.333	35.74547
7	3709	3671	3687	3689	364	45.72716
8	5073	4898	4599	4856.6667	57450.33	26.13384
9	4110	4067	4110	4095.6667	616.3333	44.34834
10	3599	3591	3535	3575	1216	40.21619
11	2551	2552	2570	2557.6667	114.3333	47.57515
12	5691	5777	5743	5737	1876	42.44137
13	2765	2786	2773	2774.6667	112.3333	48.35913
14	2891	2844	2841	2858.6667	786.3333	40.1672
15	3241	3189	3197	3209	784	41.18423
16	3235	3162	3140	3179	2473	36.11357
17	4593	4298	4219	4370	38857	26.91494
18	4120	4088	4138	4115.3333	641.3333	44.21726

Q1-(b)
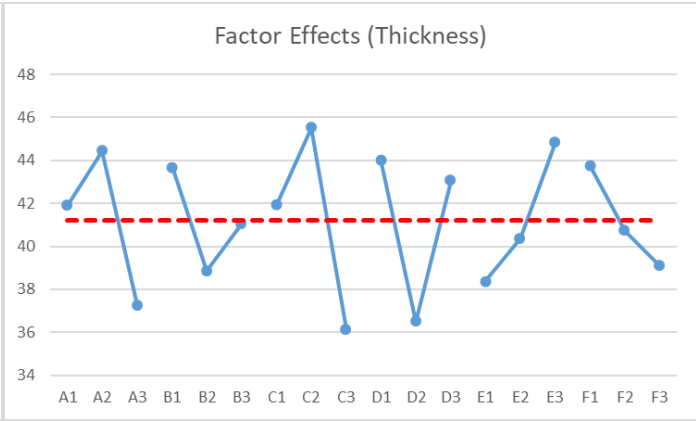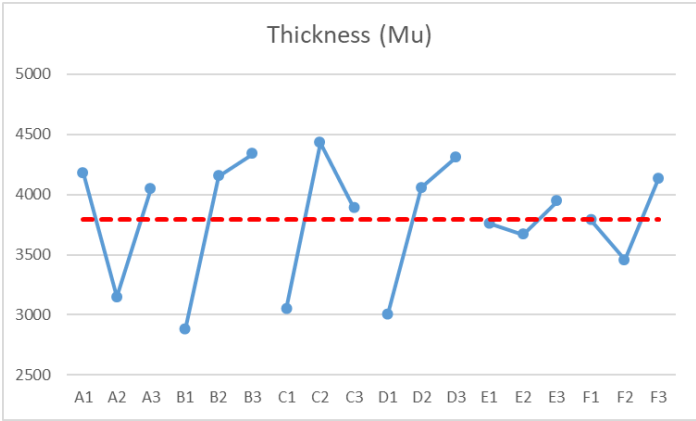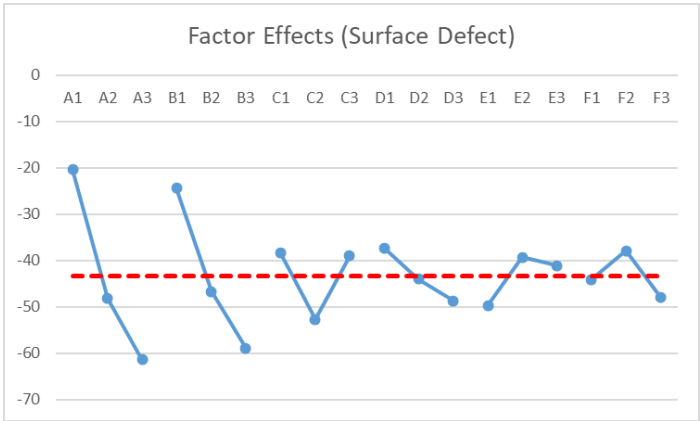
Q1-(c)

根據上表和本案例的狀況，我會選擇 A、B、C、D 當作我的 control factor，E 當作

scaling factor。

Q1-(d)

根據老師所提供的文獻，Surface Defect 是影響品質的關鍵，因此我會以 Surface

Defect 為選擇參數的主要考量。選擇 A1、B1、C1、D1、E3、F2

Q1-(e)

Factor	Setting	Optimum Condition	
		Contribution(dB)	
		Surface Defects	Thickness
A	A1	22.949	0.708
B	B1	18.904	2.490
C	C1	5.088	0.757
D	D1	5.999	2.827
E	E3	2.286	3.660
F	F2	5.402	-0.481
Overall mean		-43.336	41.194
Total		17.292	51.155

Q1-(f)

- （a）

Expt. No.	Surface Defect			Eta
	Test Wafer 1			
	Top	Center	Bottom	
1	1	0	1	1.7609126
2	1	2	8	-13.61728
3	3	35	106	-36.18745
4	6	15	6	-19.95635
5	1720	1980	2000	-65.5946
6	135	360	1620	-59.65707
7	360	810	1215	-58.77357
8	270	2730	5000	-70.35107
9	5000	1000	1000	-69.54243
10	3	0	0	-4.771213
11	1	0	1	1.7609126
12	3	1620	90	-59.43249
13	1	25	270	-43.8932
14	3	21	162	-39.49292
15	450	1200	1800	-62.11521
16	5	6	40	-27.43248
17	1200	3500	3500	-69.36849
18	8000	2500	3500	-74.39333

Expt. No.	Thickness			MU	Eta
	Test Wafer 1				
	Top	Center	Bottom		
1	2029	1975	1961	1988.3333	34.86613
2	5375	5191	5242	5269.3333	34.88096
3	5989	5894	5874	5919	39.6758
4	2118	2109	2099	2108.6667	46.92168
5	4102	4152	4174	4142.6667	41.00596
6	3022	2932	2913	2955.6667	34.11069
7	3030	3042	3028	3033.3333	52.05433
8	4707	4472	4336	4505	27.60514
9	3859	3822	3850	3843.6667	45.9856
10	3227	3205	3242	3224.6667	44.77475
11	2521	2499	2499	2506.3333	45.90354
12	5921	5766	5844	5843.6667	37.54761
13	2792	2752	2716	2753.3333	37.1975
14	2863	2835	2859	2852.3333	45.49933
15	3218	3149	3124	3163.6667	36.25572
16	3020	3008	3016	3014.6667	53.86382
17	4277	4150	3992	4139.6667	29.24592
18	3125	3119	3127	3123.6667	57.50447

● (b)

● (c)
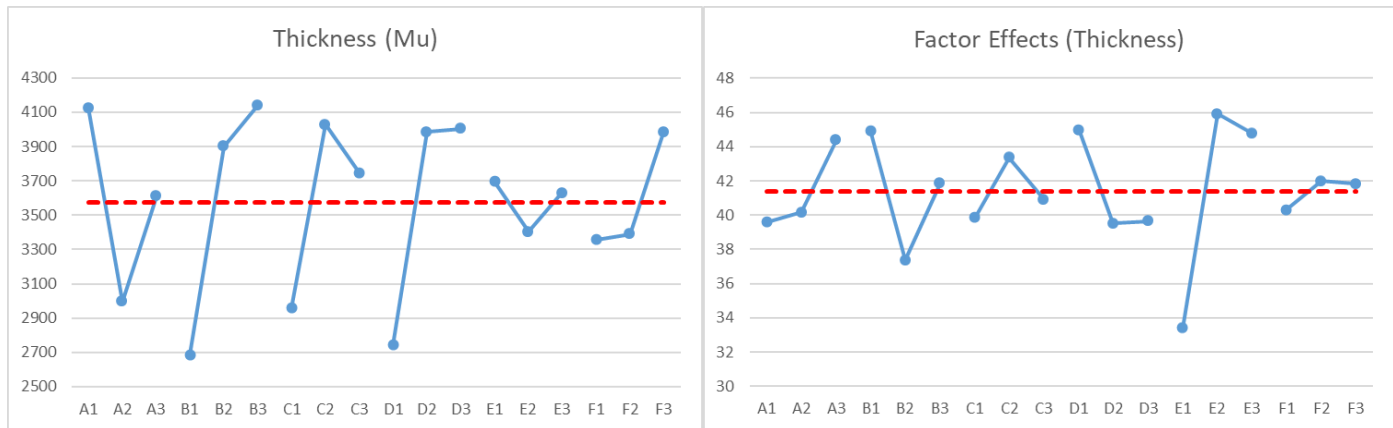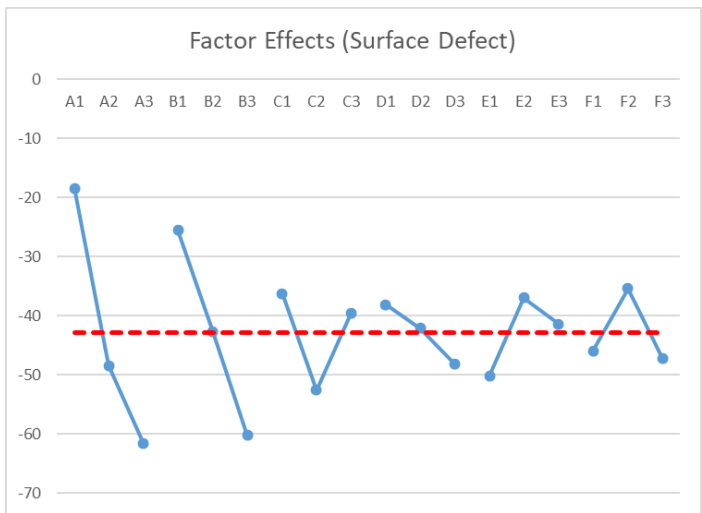
根據上表和本案例的狀況，我會選擇 A、B、C、D 當作我的 control factor，E 當作

scaling factor。

- (d)

根據老師所提供的文獻，Surface Defect 是影響品質的關鍵，因此我會以 Surface Defect 為選擇參數的主要考量。選擇 A1、B1、C1、D1、E2、F2

- (e)

Factor	Setting	Optimum Condition	
		Contribution(dB)	
		Surface Defects	Thickness
A	A1	24.422	-1.775
B	B1	17.326	3.563
C	C1	6.593	-1.520
D	D1	4.704	3.606
E	E2	5.874	3.410
F	F2	7.440	4.545
Overall mean		-42.837	41.383
Total		23.522	53.212

Q2

L'_{36} $(2^3 \times 3^{13})$ Orthogonal Array

Expt. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
3	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3
4	1	2	2	1	1	1	1	1	2	2	2	2	3	3	3	3
5	1	2	2	1	2	2	2	2	3	3	3	3	1	1	1	1
6	1	2	2	1	3	3	3	3	1	1	1	1	2	2	2	2
7	2	1	2	1	1	1	2	3	1	2	3	3	1	2	2	3
8	2	1	2	1	2	2	3	1	2	3	1	1	2	3	3	1
9	2	1	2	1	3	3	1	2	3	1	2	2	3	1	1	2
10	2	2	1	1	1	1	3	2	1	3	2	3	2	1	3	2
11	2	2	1	1	2	2	1	3	2	1	3	1	3	2	1	3
12	2	2	1	1	3	3	2	1	3	2	1	2	1	3	2	1
13	1	1	1	2	1	2	3	1	3	2	1	3	3	2	1	2
14	1	1	1	2	2	3	1	2	1	3	2	1	1	3	2	3
15	1	1	1	2	3	1	2	3	2	1	3	2	2	1	3	1
16	1	2	2	2	1	2	3	2	1	1	3	2	3	3	2	1
17	1	2	2	2	2	3	1	3	2	2	1	3	1	1	3	2
18	1	2	2	2	3	1	2	1	3	3	2	1	2	2	1	3
19	2	1	2	2	1	2	1	3	3	3	1	2	2	1	2	3
20	2	1	2	2	2	3	2	1	1	1	2	3	3	2	3	1
21	2	1	2	2	3	1	3	2	2	2	3	1	1	3	1	2
22	2	2	1	2	1	2	2	3	3	1	2	1	1	3	3	2
23	2	2	1	2	2	3	3	1	1	2	3	2	2	1	1	3
24	2	2	1	2	3	1	1	2	2	3	1	3	3	2	2	1
25	1	1	1	3	1	3	2	1	2	3	3	1	3	1	2	2
26	1	1	1	3	2	1	3	2	3	1	1	2	1	2	3	3
27	1	1	1	3	3	2	1	3	1	2	2	3	2	3	1	1
28	1	2	2	3	1	3	2	2	2	1	1	3	2	3	1	3
29	1	2	2	3	2	1	3	3	3	2	2	1	3	1	2	1
30	1	2	2	3	3	2	1	1	1	3	3	2	1	2	3	2
31	2	1	2	3	1	3	3	3	2	3	2	2	1	2	1	1
32	2	1	2	3	2	1	1	1	3	1	3	3	2	3	2	2
33	2	1	2	3	3	2	2	2	1	2	1	1	3	1	3	3
34	2	2	1	3	1	3	1	2	3	2	3	1	2	2	2	3
35	2	2	1	3	2	1	2	3	1	3	1	2	3	3	1	2
36	2	2	1	3	3	2	3	1	2	1	2	3	1	1	2	3

Notes: (i) The interactions 1 × 4, 2 × 4 and 3 × 4 are orthogonal to all columns and hence can be obtained without sacrificing any column. (ii) The 3-factor interaction between columns 1, 2, and 4 can be obtained by keeping only column 3 empty. Thus, a 12-level factor can be formed by combining columns 1, 2, and 4 and by keeping column 3 empty. (iii) Columns 5 through 16 in the array $L'_{36}(2^3 \times 3^{13})$ are the same as the columns 12 through 23 in the array $L_{36}(2^{11} \times 3^{12})$.

使用上表當作 experimental matrix，但因為現在有 three 2-level factors and nine 3-level factors，因此我們首先保留 column1, 2, 3，然後再剩下的 13 個 column 中選擇 9 個。

在本題中最終選擇使用 column 1~12 當作 experimental matrix。