Studio Project 6

Examine an experiment for wear in a pump by using parameter design for quality improvement. From the wear data for the product under the present conditions, the wear per year can be calculated, and from that the amount of wear for the design life. The object is to find design measures to reduce wear on the slider pump. The design factors are listed below:

	Design Factors	Levels
A	Material	1 and 2
B	Weight	1 and 2
C	Surface roughness	1 and 2
D	Clearance	1 and 2
E	Side Material	1 and 2
AxB	Interactions of A and B	
AxC	Interactions of A and C	

For comparison purposes, the existing product was tested under the same conditions to obtain wear data given below. The design factors are assigned to L_8 orthogonal array as shown below. The data are for wear (in microns) at eight points on the slider of the pump.

	A	**B**	**AxB**	**C**	**AxC**	**D**	**E**	**Data (μm)**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**R_1**	**R_2**	**R_3**	**R_4**	**R_5**	**R_6**	**R_7**	**R_8**
1	1	1	1	1	1	1	1	12	12	10	13	3	3	16	20
2	1	1	1	2	2	2	2	6	10	3	5	3	4	20	18
3	1	2	2	1	1	2	2	9	10	5	4	2	1	3	2
4	1	2	2	2	2	1	1	8	8	5	4	3	4	9	9
5	2	1	2	1	2	1	2	16	14	8	8	3	2	20	33
6	2	1	2	2	1	2	1	18	26	4	2	3	3	7	10
7	2	2	1	1	2	2	1	14	22	7	5	3	4	19	21
8	2	2	1	2	1	1	2	16	13	5	4	11	4	14	30
	Present product (benchmark)							17	22	7	12	10	8	18	25

Part I:

- Average Effects
  - Table and Graph
  - Main Effects and Interaction Effects
- Analysis of Variance
- Effect of Pooling (Pooled ANOVA)
- Confidence intervals of factor effect
- Estimated Results of Optimum Condition and its Confidence Interval

Part II:

- Determine S/N Ratio and Analysis of Variance
- Use **S/N Ratio + 20** in your calculations
- Find the optimum conditions
- Calculate the approximate gain as compared with the present product.