

**Course Code: MEC 309**

**Course Name: Quality Engineering & Management Systems**

**Assignment No. 3**

**DOA: 15/04/2010**

**DOS: 25/04/2010 (For OE 165)**

**26/04/2010 (For OE 166)**

**Bonus may be given for early submission and vice versa.**

**Part A**

Q.1 A construction company intends to test the efficiency of three different insulators. Since the area where the company builds has varying temperature differentials, the following experimental procedure has been planned. The company has divided the area into four geographical regions, based on climate differences. Within each geographical regions, it randomly uses each of the three insulators and records the energy loss as an index. Smaller values of the index correspond to lower losses. Table shows the energy loss data.

Geographical Region						
Insulator	I	II	III	IV	Sum	Mean
1	17.2	14.8	18.3	14.5		
2	13.7	8.4	9.3	8.2		
3	8.7	4.9	6.1	4.8		
Sum						
Mean						

- Is there a difference in the mean energy loss for the three insulator? Test at a significance level of 10 %.
- Find a 99 % confidence interval for the mean energy loss index for insulator 3.
- Find a 90 % confidence interval for the difference in the mean energy loss index of insulators 2 and 3. Is there is a difference in these two means.

Q.2 A retail company is interested in testing the impact of four different pricing policies (A, B, C and D) on sales. The company suspects that variation in sales could be affected by factors other than the pricing policy, such as store location and sales volumes. The company has four location classifications: Northeast, East, Midwest and Southwest. It has four classes of sales volume: 1, 2, 3 and 4 with class 1 representing the largest volume, and the others representing decreasing volume in succession. Each pricing policy is applied in each geographic region and each sales volume class exactly once. Table shows the sales (in thousands in dollars) for a three month period, with the pricing policy shown appropriately.

Sales Volume Class	Northeast		East		Midwest		Southeast		Sum
	A	17.2	B	17.4	C	8.6	D	12.5	
1	A	17.2	B	17.4	C	8.6	D	12.5	
2	B	15.2	C	7.3	D	10.2	A	18.8	
3	C	6.2	D	11.4	A	16.6	B	10.5	
4	D	10.4	A	15.3	B	9.6	C	8.2	
Sum									

Is there a difference in the pricing policies in terms of mean sales? Test at a level of

significance of 5 %.

- Q.3 Write the full procedure for Two-Factor Factorial Experiment using a completely Randomized Design.

**Part B**

- Q.4 Write down the steps in conducting an experiment in DOE.  
Q.5 Define the ANOVA technique.  
Q.6 What is process capability? What do you understand by  $C_p$  and  $C_{pk}$ ? Explain it with example.  
Q.7 Explain Pareto analysis and Fish bone diagram and give one example of each.

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