Exam.Code:1014
Sub. Code: 7432

2123
M.E. (Mechanical Engineering)
First Semester
MME-102: Design of Experiments

Time allowed: 3 Hours Max. Marks: 50

***NOTE**: Attempt five questions in all, selecting atleast two questions from each Unit. All questions carry equal marks.*

x-x-x

UNIT- I

I. a) What are the various strategies of experimentation? Describe the guidelines for designing the experiments.

b) Describe the brief history of statistical design?

II. a) Explain the principal steps involved in a sampling survey?

b) What is sampling? Explain the various types of sampling?

III. a) What is factorial design? Define symmetrical and asymmetrical factorial experiments?

b) With a suitable illustration, show the 2k design and fit a First order model?

IV. What is confounding? What is partial confounding and complete confounding? Distinguish between 'Confounding' and 'fractional replication'?

UNIT - II

V. Find the means of X and *Y* variables and the coefficient of correlation between them from the following two regression equations:

$$2Y - X - 50 = 0$$

$$3Y - 2X - 10 = 0$$

VI. a) The Taguchi method is considered a technique that helps build quality into a product or process? Explain what aspect of quality it influences and how?

b) What are orthogonal arrays? Give some examples.

P.T.O.

VII. Assume that you have the data from L8 OA experiment with interactions as given in Table 1.

Develop (i) Data Analysis using response graph method (ii) Data Analysis using ANOVA.

Expt No	Factors/Columns							Response		
	D	C	CD	A	AD	B	E	R1	R2	R3
	1	2	3	4	5	6	7			
1	1	1	1	1	1	1	1	11	4	11
2	1	1	1	2	2	2	2	4	4	4
3	1	2	2	1	1	2	2	4	1	14
4	1	2	2	2	2	1	1	4	0	8
5	2	1	2	1	2	1	2	9	8	4
6	2	1	2	2	1	2	1	4	1	1
7	2	2	1	1	2	2	1	1	4	4
8	2	2	1	2	1	1	2	14	4	8

VIII. An engineer is interested in the effects of cutting speed (A), tool geometry *(B)*, and cutting angle (C) on the life (in hours) of a machine tool. Two levels of each factor is chosen, and two replicates of a 2^3 factorial design is run. The results are given below.

Treatment	(1)	a	b	ab	c	ac	bc	abc
Response R_1	21	33	24	37	35	27	40	31
R_2	17	29	40	36	28	26	44	37

i) Analyze the data using ANOVA and conclude. Use alpha = 0.05.

ii) Write down the regression model to predict the response and find out R^2 and R^2adj

x-x-x