Exam.Code:1014
Sub. Code: 7750

1128

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 Section.

x-x-x

Q. No.	Section A
1 (a)	What is design of experiments? What are its Learning objectives & outcomes?
(b)	What is hypothesis? Explain null hypothesis and alternative hypothesis by taking a suitable example?
2 (a)	Describe the terms Blocking, Replication and Randomization for experimentation?
(b)	The customer accounts of a certain departmental store have an average balance of Rs. 120 and a standard deviation of Rs. 40. Assuming that the account balances are normally distributed, find (i) the proportion of the accounts which is over Rs. 150 (ii) the proportion of the accounts which is between Rs. 100 and Rs. 150. It is given that the area under the standard normal curve between 2 and z = 0.75 is 0.2734 and that between z = 0 and z = 0.5 is 0.1915.
3 (a)	Explain the concept of confounding in factorial experiments?
(b)	Describe the analysis of a completely Randomized Design with k observations percell?
4	Measurements of serum cholesterol (mg/100ml) and arterial calcium deposition (mg/100g dry weight of tissue) were made on 12 animals. The data are as follows: Calcium (X) : 59 52 42 59 24 24 40 32 63 57 36 24 Cholesterol (Y) : 298 303 233 287 236 245 265 233 286 290 264 234 Calculate the correlation coefficient.
	Section B
5 (a)	What is Response Surface Methodology? Describe the concept of Steepest Ascent to determine Optimize point in the response?
(b)	What is Signal to Noise ratio? How it is useful in Taguchi Method of experimentation? Discuss.
6 (a)	Calculate the coefficient of correlation between the marks of Math and Physics for 10+2 class of roll no. 1-5 as:

Roll No	1	2	3	4	5
Marks in math	48	35	17	23	47
Marks in Physics	45	20	40	25	45

(b)	Enumerate parametric and non-parametric tests. Describe the condition for applying chi square test with suitable illustration.
7	The output voltage measured from two brands of compressors A and B is as follows. The samples were selected randomly. Brand A: 230, 225, 220, 250, 225, 220, 220, 230, 240, 245 Brand B: 220, 215, 222, 230, 240, 245, 230, 225, 250, 240

P.T.O.

	Assume that the output voltage follows normal distribution has equal Variance. i) Test the hypothesis that the output voltage from both the brands is same. Use alpha= 0.05. ii) Construct a 95% confidence interval on the difference in the mean output voltage.
8	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