Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 03

Total No. of Questions : 07

B.Tech (Ind. Engg. & Mgt.) (Spl. in TQM)   (Sem.–7)
ADVANCED QUALITY TOOLS
Subject Code : IEM-751
Paper ID : [71698]

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. Attempt EIGHT out of TEN questions from SECTION-A carrying THREE marks each.
2. Attempt any FOUR out of SIX questions from SECTION-B carrying NINE marks each.

SECTION-A

Q1. Answer briefly :

a. Write benefits of advanced quality tools.

b. What do you mean by Matrix data analysis diagram?

c. Describe the situation where chi-square test can be employed.

d. Enlist advantages of using design of experiments.

e. Write various factors that are to be considered in the selection of an orthogonal array.

f. What do you mean by signal to noise ratio?

g. Write the various types to graphs that can be plotted by using M1NITAB.

h. What is one way ANOVA? Discuss.

i. Write application of systematic diagram.

j. Write advantages of ANOVA over t-test.

SECTION-B

Q2. Three adhesives are being analyzed for their impact on the bounding strength of paper in a pulp and paper mill. The adhesives are each randomly applied to four batches. The data is shown in table. Here, the three treatments are the adhesive (p = 3), and the number of replications for each treatment is 4(r = 4). The completely randomized design is a balanced one. Find the 90% confidence interval for the mean bonding Strength of adhesive 1.

Adhesive type	Bonding Strength (kg)				Sum	Mean
Adhesive 1	10.2	11.8	9.6	12.4	44.0	11.000
Adhesive 2	12.8	14.7	13.3	15.4	56.2	14.050
Adhesive 3	7.2	9.8	8.7	9.2	34.9	8.725
					135.1	11.258

Q3. In the furniture industry the quality of surface finish of graded lumber is an important characteristic. Three factors are to be tested, each at two levels, for their impact on the surface finish. Factor A is the type of wood: oak (level-1) or pine (level 1). Factor B is the rate of feed : 2m/min (level -I) or 4m/min (level 1). Factor C is the depth of cut: 1 mm (level-1) or 3mm (level 1). For each treatment combination three replications are carried out using a completely randomized design. Table 2 shows the surface finish for the eight treatments. The larger the value, the rougher the surface finish. Find the main effects and the interaction effects.

Treatment	Surface finish			Sum
1	6	8	9	23
a	10	16	15	41
b	18	12	15	45
ab	12	9	10	31
c	20	26	19	75
ac	34	28	32	94
bc	36	44	46	126
abc	25	22	24	71

Q4. The following table gives the number of refrigerators sold 4 salesmen in three months May, June and July.

Month	Salesman			
	A	B	C	D
May	50	40	48	39
June	46	48	50	45
July	39	44	40	39

Is there a significant difference in the sales made by the four salesmen?

Q5. Explain the steps for constructing affinity diagram by taking suitable example.

Q6. The data given in table below have been collected from 2^3 design. Fit a first order model.

Factors			Y
X_1	X_2	X_3	
-1	-I	-1	31
1	-1	- 1	43
-1	1	-1	34
1	1	-1	47
-1	-1	1	45
1	-1	1	37
-1	1	1	50
1	1	1	41

Q7. A study was conducted involving three factors A, B and C, each at three levels. The data is given in Table below. Analyze using ANOVA and identify optimal levels for the factors. The objective is to minimize the response.

	Factors/Columns				Results	
Trial No.	A	B	C	D	R_1	R_2
	1	2	3	4		
1	1	1	1	1	2.32	2.50
2	1	2	2	2	2.40	2.80
3	1	3	3	3	1.75	2.80
4	2	1	2	3	0.85	1.00
5	2	2	3	1	1.70	1.50
6	2	3	1	2	1.30	1.60
7	3	1	3	2	2.35	1.30
8	3	2	1	3	1.60	2.30
9	3	3	2	1	1.40	1.10

Determine the average response for each factor level and identify the significant effects.