(3 hours)   Total Marks : **80**

N.B : (1) Attempt any 4 Questions
       (2) Figures to the right indicate full marks
       (3) Assume suitable data wherever necessary and mention it clearly
       (4) Use of statistical charts are permitted

Q.1   Answer the following:

i .   What are the critical factors involved in "Selection of Seating Chair"?   **8**
       What are the response variables and how to measure it?

ii.   List potential sources of variability in "Seating Chair selection" that would   **6**
       impact the response.

iii.   Give the advantages of one-half designs of experimentation with an   **6**
       example.

Q.2   Answer the following: **20**

Inner Array		1	1	2	2	**X**
A	**B**	1	2	1	2	**Y**
1	1	174	168	184	171	
1	2	155	166	166	152	
1	3	174	168	184	171	
2	1	155	166	166	152	
2	2	174	168	184	171	
2	3	155	166	166	152	
3	1	216	155	204	214	
3	2	207	213	184	176	
3	3	184	172	166	155	

(Outer Array spans the four value columns)

An experiment was conducted in measurement of temperature using
thermometer setup. There are two controllable variables viz. A (Current in
Amp.) and B(Time of heating in min.) and two noise variables X (Air
Humidity – 40% & 65%)and Y(Air Temperature 25 & 28 deg.C). The
response variable is the temperature measurement of heated wire whose
readings are given in the above table.

   (I)   Calculate average response of factors

   (II)   Using robust design approach, find the optimal combination of
           factors.

Q.3 **Answer the following:**
 i. Explain "Nominal-the-Best" Taguchi approach with an example. **10**
 ii. Give Differences between: Replication, Randomization and Blocking **10**

Q.4 **Solve the following:**
 i. Explain the procedure for conducting 2 level 2 factor full DOE experiment with ANOVA analysis. How will you check significance of factors in ANOVA table? Take a suitable example if required. **15**

 ii. Explain: multiple regression Analysis and its applications **5**

Q.5 **Solve the following:**

 i. A study was performed to measure the temperature of room and its relationship to $X1$ = fan speed , $X2$ = humidity of air. The following data were obtained as below:-

Temperature of room (Y)	Fan speed (X1)rpm	Humidity of Air Kmph(Y)
10	250	45
20	400	55
25	500	66

15

 (i) Fit a regression model for the above data.

 ii. Write short notes on: OFAT designs and its advantages. **08**

Q.6 **Answer the following:**
 i. Discuss on : Residual plots in Regression Analysis. **10**
 ii. Give Differences between: Replication, Randomization and Blocking **10**

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