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

Note:

1. **Question No. 1 is compulsory**.
2. Attempt any **THREE** out of the remaining **FIVE** questions.
3. Assume suitable data if necessary.

Q. 1. Answer **any FOUR** of the following: **(20)**

(a) What is Design of Experiments? Describe in short the different factors and level selection for "Selection of Trolley Suitcase for Travelling".

(b) What are the key, main, and interaction effects in the process? Give an example.

(c) Write short notes on Response Surface Method.

(d) Give Typical applications of Experimental Design.

(e) What is Strategy of Experimentation?

Q. 2. (a) Develop the Analysis of Variance for a 3^2 Factorial design **(10)**

(b) The values of y and their corresponding values of y are shown in the table below: **(10)**

x	2	4	8	12	16
y	50	80	100	150	180

a) Find the least square regression line y = a x + b.

b) Estimate the value of y when x = 14.

Q. 3. (a) What is Hypothesis Testing? What are the types of errors in Hypothesis testing? **(10)**

(b) What is the procedure for estimating the parameters in Linear Regression Model? Explain with an example. **(10)**

Q. 4. (a) Explain general steps involved in the Taguchi Method. What is Taguchi's Loss Function? **(10)**

(b) 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.) The response variable is the temperature measurement of heated wire whose readings are given in the above table. **(10)**

A	B	Reading 1	Reading 2
1	1	120	174
1	2	125	165
1	3	183	111
2	1	194	155
2	2	175	175
2	3	126	126
3	1	162	155
3	2	175	122
3	3	172	153

1. Calculate average response of factors

Using robust design approach, find the optimal combination of factors. (Use Larger- the- Better) criteria.

Q. 5. (a) Give the differences between Replication, Randomization and Blocking in Experimental Design. **(10)**

(b) Explain: multiple regression Analysis and its applications **(10)**

Q. 6. **Attempt the following:-** **(20)**

(a) Discuss on : Residual plots in Regression Analysis.

(b) Explain: Confidence intervals in regression

(c) List potential sources of variability in Scoring higher marks in exams that would impact the response.

(d) Write short notes on Resolution III,IV and V Designs.

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