

TTL773: Design of Experiments and Statistical Techniques
Minor Test 2

Maximum Marks = 25

Date: March 22, 2015, Sunday

Time: 1 pm - 2 pm

Venue: IVLT3

Answer all questions.

1) If the results of a one-factor-at-a-time experiment indicate that A^+B^- and A^-B^+ give better response than A^-B^- then A^+B^+ always gives even better response. Do you think that this statement is correct? If yes, why? If not, why not? Use numerical data for your reason. (2)

2) The R^2 between the experimental data of a 2^2 factorial design with one replicate and the data predicted by a first order model of the form $(y = \beta_0 + \beta_1x_1 + \beta_2x_2)$ is 0.90. Calculate R_{adj}^2 . (3)

3) A 2^2 factorial experiment is conducted with two blocks and the design is replicated twice. Subsequently, the following two tables are prepared for analyzing the variances. Which of the two tables is correct and why? (6)

Table 1

Sources of variation	Degrees of freedom
Factor A	1
Factor B	1
Blocks (AB)	1
Error	4
Total	7

Table 2

Sources of variation	Degrees of freedom
Factor A	1
Factor B	1
Blocks	3
Error	2
Total	7

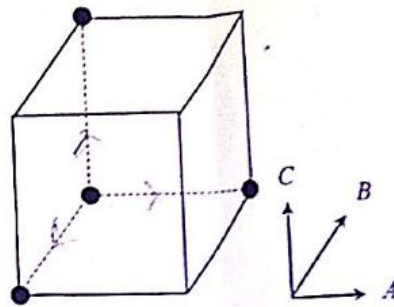
4) A 2^2 factorial experiment is carried out in three blocks and the results are shown below. Calculate the sum of squares due to block. (3)

Block 1
(1) = 28
a = 36
b = 18
ab = 31

Block 2
(1) = 25
a = 32
b = 19
ab = 30

Block 3
(1) = 27
a = 32
b = 23
ab = 29

5) Somebody claims that a 2^{3-1}_{III} fractional factorial design, with generating relation $I = -ABC$, looks like



where • refers to the design point. Do you support the claim? If yes, why? if not, why not and sketch the correct design? (3)

6) In a 2^3 factorial experiment, the blocks are designed as follows.

Block 1 : (1), b, ac, abc

Block 2 : a, ab, c, bc

Identify the confounded effect.

Block
factor

(3)

7) The quantity of adhesive formed on a gummed material is determined under a factorial experiment with three levels of humidity and three levels of temperature. Four readings are made under each set of conditions. The resulting ANOVA table is shown below.

Sources of variation	Sum of squares	Degree of freedom	Mean square	F-value (calculated)	F-value at $\alpha = 0.05$	Significant (Write Yes or No)
Humidity	9.07					
Temperature	8.66					
Humidity \times Temperature	6.07					
Error						
Total	52.30					

Complete this table.

(5)