



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

INSTITUTIONAL BASED PROGRAMME (IBP) – AUGUST SESSION EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SMA 561: DESIGN OF EXPERIMENTS II

DATE: Friday 30th December 2011

TIME: 9.00a.m – 12.00p.m

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS ONLY

- Q1 (a) Give the axioms for the existence of a plane projective geometry
- (b) Construct a balanced incomplete block design with parameters $v=7, b=7, r=3, k=3$ and $\lambda=1$ using plane projective geometry. What other B.I.B design can be obtained from the above design?
- (c) Define confounding in factorial design.
- (d) Define a Graeco-Latin square and construct one of size 5×5 .
- (e) Consider the factorial design with S^m treatments where $S=2$ and $m=4$. If an $\left(\frac{1}{S^2}\right)$ fractional factorial design is to be constructed using the flat
- $$\begin{aligned}x_1 + x_2 + x_4 &= 1 \\x_2 + x_3 + x_4 &= 0\end{aligned}$$
- give the treatment composition.
- Q2 (a) (i) Define a symmetric factorial experiment.
- (ii) Show that there is a one-one correspondence between the elements of a symmetric factorial experiment S^m and the points of EG(MS). Using this relationship, define the main effects and a k factor interaction, $K=2,3,\dots,M$.
- (b) Show that treatment contrasts belonging to pencils $P(a_1, a_2, \dots, a_m)$ are orthogonal to those of pencil $P(b_1, b_2, \dots, b_m)$
- Q3 (a) Show how a latin square design is constructed when a GF(s) exists where $s=p^n$, p prime and $n>2$. Illustrate by constructing the first square using $p=2$ and $n=2$.
- (b) Give the analysis of a Graeco-Latin square design including its ANOVA.

- Q4
- (a) Describe a nested design (fixed effects) and state the hypothesis to be tested in the design.
 - (b) Obtain the least squares estimates of the parameters in the nested design and give the ANOVA table.
 - (c) Derive the expected sum of squares in a nested design.