



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SMA 561: DESIGN OF EXPERIMENTS II

DATE: Monday 26th March 2012

TIME: 9.00a.m – 12.00p.m

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO QUESTIONS ONLY

- Q1 (a) (i) Describe how the elements of a $GF(S)$, $S=P^n$, P prime and n an integer are obtained for purposes of construction of experimental designs.
(ii) Give the elements of $GF(2^3)$.
- (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.
- (d) Describe a split-plot design (fixed effects) and state the hypothesis to be tested in the design.
- Q2 (a) 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?
- (b) (i) Define confounding in factorial design.
(ii) Consider the factorial design with S^m treatments where $S=2$ and $m=3$. If the design is to be confounded using the flats of pencil $P(1,1,1)$, give the block composition.
- Q3 (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 $P(b_1, b_2, \dots, b_m)$
- Q4 (a) Construct two pairwise orthogonal Latin Squares of size 5 x 5.
- (b) (i) Construct a Graeco-Latin Square design corresponding to the squares described above.
- (ii) Give the analysis of a Graeco-Latin (two squares) square design including its ANOVA.