



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2014/2015

CITY CAMPUS

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTERS OF
SCIENCE

SMA 561: DESIGN OF EXPERIMENTS II

DATE: THURSDAY 2ND APRIL, 2015

TIME: 5.30 P.M – 8.30 P.M

INSTRUCTIONS:

Answer questions ONE and any other TWO questions only.

- Q1 (a) (i) Give the axioms for existence of a finite plane Euclidean geometry.
(ii) Explain how a finite plane Euclidean geometry can be constructed from a finite plane projective geometry. (8mks)
- (b) Show how Finite Plane Projective Geometry can be used to construct a BIB design with parameters $v=13$, $b=13$, $r=4$, $k=4$ and $\lambda=1$ (7mks)
- (c) (i) Define a Graeco-Latin square.
(ii) Construct a Graeco Latin Square of size 7×7 . (4mks)
- (d) Define a confounding in factorial designs and illustrate how treatment contrasts and block contrasts are confounded. (5mks)
- (e) Consider an (S^m, S^k) confounded factorial design where $S=2$, $m=4$ and $k=2$. List the treatments of the design and confound the design such that treatment contrasts belonging to the three factor interaction three factors $F_1F_2F_3$ and $F_1F_2F_4$ are not estimable. (7mks)
- Q2 (a) (i) Define fractional factorial design and give the circumstances under which it is applied. (4mks)
(ii) Consider the factorial design with S^m treatments where $S=2$ and $m=4$.
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If an $\left(\frac{1}{S^2}\right)$ fractional factorial design is to be constructed using the flat

$$x_1 + x_2 + x_4 = 1$$

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give the treatment composition.

(5mks)

(b) Explain the following.

(i) Partially balanced confounded design.

(3mks)

(ii) Balanced confounded design.

(3mks)

(c) In a symmetric factorial design, show how the treatment degrees of freedom are distributed to various types of treatment contrasts.

(5mks)

Q3 (a) Consider the $GF(s)$ where $s=3^2$. Obtain the equivalents of the field elements using the irreducible polynomial x^2+x+2 .

(7mks)

(b) (i) Explain how a latin square design is constructed when a $GF(s)$ exists where $s=p$, p prime.

(ii) prove that the square constructed in (i) is a Latin square.

(5mks)

(c) Explain how a latin square design is constructed when a $GF(s)$ exists where $s=p^n$, p prime and $n>2$.

(8mks)

Q4 (a) Describe a nested design (fixed effects) and state the hypothesis to be tested in the design.

(6mks)

(b) Obtain the least squares estimates of the parameters in the nested design and give the ANOVA table.

(9mks)

(c) Define two factor interaction effects treatment contrast in a general factorial design stating clearly the distribution of the degrees of freedom.

(5mks)

END