MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
FIRST YEAR, SECOND SEMESTER

SCHOOL OF SCIENCE
MASTERS OF SCIENCE IN APPLIED STATISTICS WITH COMPUTING

COURSE CODE: STA 8193

COURSE TITLE: DESIGN AND ANALYSIS OF EXPERIMENTS II

DATE: TUESDAY 23RD APRIL 2019   TIME: 11:00AM – 2:00PM

INSTRUCTIONS TO CANDIDATES

1. Answer Question **ONE** and any other **TWO** questions
2. No writing on the Question paper
3. Use of mobile phone in the exam room is prohibited

This paper consists of three printed pages. Please turn over.

QUESTION ONE [COMPULSORY, 30 MARKS]

(a) Define the following terms as used in the design of experiment.
    i)   Split plot design   **[3 marks]**
    ii)   Orthogonal contrast   **[3 marks]**

(b) Explain the advantages of split-plot design over a completely randomized design of experiment. **[4 marks]**

(c) From PG (2, 2) and EG(2,2) construct balanced incomplete block designs. **[8 Marks]**

(d) Suppose v=b and r=k, show that any two blocks in a BIB design have 2 treatments in common. **[5 Marks]**

(e) Prove that by omitting any block of a BIB design in which b=r, r=k, and retaining the treatments belonging to the remaining blocks, then the results is BIB design. **[5 Marks]**

(f) State two disadvantages of Latin square design. **[2 marks]**

QUESTION TWO [20 MARKS]

a) Differentiate between the following terms as used in the design and analysis of experiment.
    i) Resolution IV and Resolution V.   **[4 marks]**
    ii) Fold over and partial fold over designs.   **[4 marks]**

b) Suppose we have two blocks at 3 levels of A (main plots) and 3 levels of B (subplots per main plot). The data is

Block 1		
a1b1=10	a1b3=12	a1b2=14
a3b3=8	a3b2=9	a3b1=7
a2b2=16	a2b1=13	a2b3=15

Block 2		
a3b1=10	a3b3=9	a3b2=12
a1b1=15	a1b3=18	a1b2=19
a2b3=24	a2b2=18	a2b1=20

Obtain ANOVA table for both main and sub plots. **[12 Marks]**

QUESTION THREE *[20 MARKS]*

(a) State the advantages of a factorial experiment over a simple experiment.   **[3 marks]**

(b) For successful use of fractional factorial designs, three principles or ideas must be considered. State and explain.   **[6 Marks]**

(c) Describe the following methods of performing posthoc ANOVA analyses

    i. Duncan Multiple Range Test (DMRT)   **[2 marks]**

    ii. Fisher's Least Significant Difference (LSD)   **[3 marks]**

    iii. Scheffé's Method   **[3 marks]**

    iv. Tukey's Test   **[3 marks]**

QUESTION FOUR *[20 MARKS]*

(a) An agronomist intends to compare the effects of three harvesting mechanisms on four varieties of cranberries. The harvesting methods can only be applied to complete fields, but all four varieties can be grown on the same field and the response of interest is the yield. Twelve fields are available for the experiment and the response of interest is the yield of high quality fruit.

    i) Describe how to construct and randomized a split-plot design for this experiment.   **[7 marks]**

    ii) Write down the skeleton analysis of variance, showing strata, sources of variation and degrees of freedom.   **[5 marks]**

(b) Discuss the process of designing and performing an experiment.   **[8 Marks]**

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