

Mid-West University  
Examinations Management Office  
End Semester Examinations -2080

Bachelor level/ B. Sc /6<sup>th</sup> Semester  
Time: 3 hours

Full Marks: 100  
Pass Marks: 50

Subject: Design of Experiments (STAT461)

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

**GROUP A**

- 1) Answer in short. [7x2=14]
- What do you understand by ANOVA?
  - Differentiate between one way and two ways ANOVA.
  - Explain the term with example; Treatment and experimental units.
  - State Cochran's theorem.
  - Under what condition Latin Square design can be used?
  - Mention advantages of factorial design.
  - What is analysis of co-variance?

**GROUP B**

- 2) Answer in brief. [10x3=30]
- What are the assumptions of analysis variance?
  - Describe the application of ANOVA.
  - Give layout and mathematical model of one-way ANOVA.
  - Differentiate between simple design and factorial design.
  - What are the principles of design of experiment? Explain randomizations.
  - Write down the advantage and disadvantage of CRD.
  - Discuss the purpose of Latin Square Design.
  - Differentiate between fixed effect model and random effect model in ANOVA.
  - What is confounding? Also write down its type.
  - Give layout of 3<sup>2</sup> design.

**GROUP C**

[8x7=56]

Attempt any Eight Questions

- In one way ANOVA with model  $x_{ij} = \mu + \alpha_i + e_{ij}$ ;  $i = 1, 2, \dots, a$  and  $j = 1, 2, \dots, n$ , by using this information, give layout of one way ANOVA and show that:  $\sum_{i=1}^a \sum_{j=1}^n (x_{ij} - \bar{x}_{..})^2 = n \sum_{i=1}^a (\bar{x}_{i.} - \bar{x}_{..})^2 + \sum_{i=1}^a \sum_{j=1}^n (x_{ij} - \bar{x}_{i.})^2$  [7]
- Write down the layout of two-way ANOVA with one observation per cell with its assumption, effect model. [3+2+2]
- Explain RBD with statistical analysis and ANOVA table. Also write down its advantage and disadvantage. [5+2]
- Derive the expression for the missing observation in LSD. Describe analysis process after computing the missing observation. [5+2]
- Consider the partially completed ANOVA table below. Complete the ANOVA table and answer the following. What design were employed? How many treatments were compared? How many observations were analyzed? At  $\alpha = 0.05$ , can you conclude that the treatments have different effects? [7]

Source of variance	Degree of freedom	Sum of square	Mean square	F - value
Rows	-	72	-	-
Columns	-	-	36	-
Treatments	-	180	-	-
Error	6	-	12	-
Total	-	-	-	-

- Derive the expression to measure the efficiency of LSD over CRD. [7]
- Describe 2<sup>2</sup> factorial design. [7]
- What do you understand by 2<sup>3</sup> design? Mention its layout mathematical model and ANOVA table of RBD performed for 2<sup>3</sup> design. [2+5]
- Write down importance confounding. Also describe partial confounding. [2+5]

THE END