

MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

CAT 2 Examinations for BSM/BMC/BED 2024/2025

SMS 3400: Design and Analysis of Experiments

DUE Date: 13-12-2024

Time: 1400 Hours

- The mathematics department of a Meru University of Science and Technology wishes to evaluate the teaching capabilities of 4 professors and 4 teaching assistants. In order to eliminate any effects due to different mathematics courses and different times of the day, it was decided that an experiment using a Latin square design in which the letters A, B, C and D represent the 4 different professors and α, β, γ and δ represent the teaching assistants be conducted. Each professor and each teaching assistant taught one section of each of the 4 different courses scheduled at each of the 4 different times during the day. The data in the following table show the grades assigned by each professor and each teaching assistant to 16 students of approximately equal ability:

Time Period	Course			
	Algebra	Insurance	Statistics	Calculus
1	$A_{84}\alpha_{79}$	$B_{79}\beta_{81}$	$C_{63}\gamma_{65}$	$D_{97}\delta_{94}$
2	$B_{91}\delta_{90}$	$A_{82}\gamma_{80}$	$D_{80}\beta_{79}$	$C_{93}\alpha_{94}$
3	$C_{59}\beta_{62}$	$D_{70}\alpha_{68}$	$A_{77}\delta_{80}$	$B_{80}\gamma_{82}$
4	$D_{75}\gamma_{73}$	$C_{91}\delta_{88}$	$B_{75}\alpha_{74}$	$A_{68}\beta_{74}$

Use a 0.05 level of significance to test the hypothesis that

- There is no difference in the grades due to different time periods;
 - the courses are of equal difficulty;
 - different professors have no effect on the grades;
 - different teaching assistants have no effect on the grades.
- Three strains of rats were studied under 2 environmental conditions for their performance in a maze test. The error scores for the 48 rats were recorded as follows:

Environment	Strain					
	Bright		Mixed		Dull	
Free	28	12	33	83	101	94
	22	23	36	14	33	56
	25	10	41	76	122	83
	36	86	22	58	35	23
	72	32	60	89	136	120
Restricted	48	93	35	126	38	153
	25	31	83	110	64	128
	91	19	99	118	87	140

Use a 0.01 level of significance to test the hypothesis that

- there is no difference in error scores for different environments; (3 marks)
- there is no difference in error scores for different strains; (3 marks)
- the environments and strains of rats do not interact. (4 marks)