LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

FOURTH SEMESTER – **APRIL 2025**

PST4MC01 – ADVANCED EXPERIMENTAL DESIGN

Date: 23-04-2025 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

	SECTION A – K1 (CO1)	
	Answer ALL the questions	**(5 x 1 = 5)**
1	**Answer the following**	
a)	Give any one example of mutually orthogonal contrasts?	
b)	Write the efficiency of RBD over CRD.	
c)	Write any two applications of factorial experiment.	
d)	In a 2^2 factorial design with (1)=35, (a) = 40, (b) =50, (ab) = 42 obtain the interaction effect AB.	
e)	What is the role of incidence matrix in BIBD?	
	SECTION A – K2 (CO1)	
	Answer ALL the questions	**(5 x 1 = 5)**
2	**MCQ**	
a)	A (2 X 2) factorial a) is essentially two designs that have been combined into a single study. b) contains four factors. c) does not have enough factors to show interactions. d) is extremely difficult to interpret if interactions are found.	
b)	What is the purpose of blocking in experimental design? a) To reduce the variability within treatment groups. b) To control for confounding variables. c) To ensure a balanced representation of different treatments. d) To increase the sample size of the experiment.	
c)	Analysis of variance is a statistical method of comparing the _____ of several populations. a) standard deviations b) variances c) means d) proportions	
d)	In CRD, _____ observations are deleted. a. Missing b. Fixed c. Random d.None of them	
e)	The method of confounding is a device to reduce the size of a) experiments b) replications c) blocks d) All of these.	

	SECTION B – K3 (CO2)
	Answer any THREE of the following **(3 x 10 = 30)**
3	Explain the analysis of 2^3 factorial experiment.
4	Establish the One missing observation in Latin Square design.
5	What is asymmetrical factorial experiment? Give the analysis of 3X2 factorial experiment.
6	State and prove the Fisher's inequality.
7	Construct balanced incomplete block design mutually orthogonal Latin square design when s=3.
	SECTION C – K4 (CO3)
	Answer any TWO of the following **(2 x 12.5 = 25)**
8	Derive the main effects and interaction effects for a 2^2 design using dummy coding procedure and effect coding procedure.
9	What is the fractional factorial experiment? Explain the construction of 2^{6-2} design by using I=ABCE and I=BCDF as the generators.
10	Explain the construction and analysis of split-plot design.
11	Write the analysis of 3x2x2 factorial design with block size 4.
	SECTION D – K5 (CO4)
	Answer any ONE of the following **(1 x 15 = 15)**
12	Construct the layout of 2^3 such that ABC is confounded in replication I, AC is confounded in replication II and AB is confounded in replication III. Also explain the changes in ANOVA table.
13	Describe in detail about the implementation of ANOCOVA technique for the analysis of one way classified data with a single concomitant variable in RBD layout.
	SECTION E – K6 (CO5)
	Answer any ONE of the following **(1 x 20 = 20)**
14	(i) Establish the intra block analysis of BIBD. (ii) Write the main effects and the interaction effects of 3^2 factorial design.
15	Fit a first order response surface design for the following data and identify the path of steepest ascent:

X_1	30	30	40	40	35	35	35	35	35
X_2	150	160	150	160	155	155	155	155	155
Y	39.3	40	40.9	41.5	40.3	40.5	40.7	40.2	40.6

$$$$$$$$$$$$