CHRIST UNIVERSITY, BENGALURU - 560029

End Semester Examination October - 2017 Bachelor of Science-CMS V SEMESTER

Code: STA531 Max.Marks: 100
Subject: DESIGN OF EXPERIMENTS AND RESEARCH METHODOLOGY Duration: 3Hrs

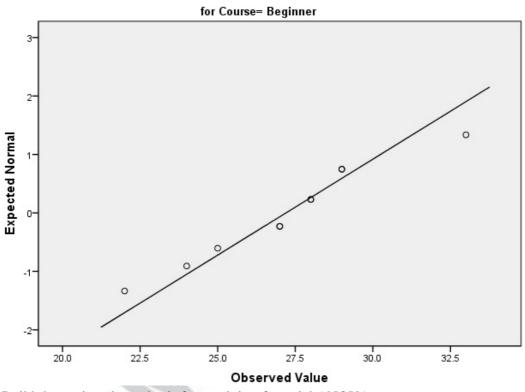
SECTION A

Answer any TEN questions.

10X3 = 30

- 1 Distinguish between population and sample with examples.
- 2 Create a stratified sampling procedure to study student's achievements in different schools of a district? Explain in brief.
- 3 Compose all steps for the following procedure using systematic sampling.
 Select a sample of 25 rooms in your college, makes a list of all the room numbers.
- 4 Discuss the limitations of Sampling.
- 5 What is an "experimental unit"? Give two examples.
- 6 Identify two disadvantages of a Latin square design.
- 7 Build an example to illustrate "Interaction" in an experiment.
- **8** Define a 2^3 factorial experiment.
- 9 Analyze briefly, the various types of scientific research.
- 10 List some essentials of a good questionnaire.
- 11 Write a few lines about this graph.

Normal Q-Q Plot of Time



12 Build the various hypothesis for applying factorial ANOVA.

SECTION B

ANSWER ANY FIVE questions

5X6=30

- 13 Consider a population of 5 units (choose your own units). Write all possible samples of size 2, WOR from this population and verify that sample mean is an unbiased estimate of population mean.
- 14 Interpret SRS for attributes.
- 15 Identify the design and state its disadvantages.

Suppose we have 4 different diets which we want to compare. The diets are labeled Diet A, Diet B, Diet C, and Diet D. We are interested in how the diets affect the coagulation rates of rabbits. The coagulation rate is the time in seconds that it takes for a cut to stop bleeding. We have 16 rabbits available for the experiment, so we will use 4 on each diet.

- Examine "treatment contrast". When are two such contrasts said to be orthogonal? Show that in a 2^2 factorial experiment the main effects and the interaction effects are mutually orthogonal.
- Write a brief note on multivariate analysis techniques.
- 18 List all steps to analyse this design using SPSS.

Table 4-8 Latin Square Design for the Rocket Propellant Problem

Batches of Raw Material	Operators					
	1	2	3	4	5	
1	A = 24	B = 20	C = 19	D = 24	E = 24	
2	B = 17	C = 24	D = 30	E = 27	A = 36	
3	C = 18	D = 38	E = 26	A = 27	B = 21	
4	D = 26	E = 31	A = 26	B = 23	C = 22	
5	E = 22	A = 30	B = 20	C = 29	D = 31	

SECTION C

Answer any FOUR questions

4X10=40

- 1) If Var(Ybar)_{str}, _P=2.1177, Var(Ybar)_{str, Neymann} = 1.76, Var (Ybar) _R= 3.8174, Compare the gain in efficiency of Stratified random Sampling over SRS in both cases of proportional allocation and Neyman allocation.
 - 2) Write about Proportional allocation with notations.
- 20 Compare Systematic Sampling and SRS in a population with linear trend.
- 21 Examine CRD statistically.
- If the yields and plan of a 2² factorial experiment involving 2 factors N and S at 2 levels 0 and 1, how do you to propose statistically analyze this?
- 23 Define 2³ factorial design. Statistically analyze it.
- 24 List all the steps for analyzing the following Latin Square design in SPSS.

An experiment was conducted at Agricultural Research Station, Kopurgaon, Maharashtra on cotton during the year 1969-1970 using a Latin Square Design to study the effects of foliar application of urea in combination with insecticidal sprays on the cotton yield. The 6 treatments were $\{T_1 : Control\ (i.\ e.\ no\ N\ and\ no\ insecticides),\ T_2:100\kg\ N/ha\ applied\ as\ urea\ (half\ at\ final\ thinning\ and\ half\ at\ flowering\ as\ top\ dressing),\ T_3:\ 100\kg\ N/ha\ applied\ as\ Urea\ (80\ kg\ N/ha\ In\ 4\ equal\ split\ doses\ as\ spray\ and\ 20\ kg\ N/ha\ at\ final\ thinning\ and\ half\ at\ flowering\ as\ top\ dressing),\ T_5:\ T_2+ six\ insecticidal\ sprays,\ T_6:\ T_4+ six\ insecticidal\ sprays\}.$ There were 6 replication, and the data of cotton in kg per plot is:

T ₃ 3.10	T ₆ 5.95	T ₁ 1.75	T ₅ 6.40	T ₂ 3.85	T ₄ 5.30
T ₂ 4.80	T ₁ 2.70	T ₃ 3.30	T ₆ 5.95	T ₄ 3.70	T ₅ 5.40
T ₁ 3.00	T ₂ 2.95	T ₅ 6.70	T ₄ 5.95	T ₆ 7.75	T ₃ 7.10
T ₅ 6.40	T ₄ 5.80	T ₂ 3.80	T ₃ 6.55	T ₁ 4.80	T ₆ 9.40
T ₆ 5.20	T ₃ 4.85	T ₄ 6.60	T ₂ 4.60	T ₅ 7.00	T ₁ 5.00
T ₄ 4.25	T ₅ 6.65	T ₆ 9.30	T ₁ 4.95	T ₃ 9.30	T ₂ 8.40