CONTENTS

FOREWORD	ix
ACKNOWLEDGEMENTS	хi
INSTRUCTIONAL OBJECTIVES	xii
SUBJECTS	xiv
SCHEMATIC	xix
CHAPTER 1 DEFINITIONS AND DESCRIPTIONS	*1
CHAPTER 2 EXPERIMENTAL PROCEDURES:	
TECHNIQUE AND APPROACH Scientific Method I Hypothesis I Engineering Approach I Variables I Models I Dimensional Analysis I Similitude I Numerical Values and Considerations I Rounding Off	1
Numbers I Precision of Measurement, Significant Numbers I Binary Numbers I Analog I Ternary Numbers.	

CHAPTER 3 ERRORS—THEIR IDENTIFICATION AND DESIGNATION Maximum Relative Error / Probable Error, Errors in Hypothesis I Analytical Error / Erratic and Short Period Errors / Precision Error and Accuracy Error.	25
CHAPTER 4 MEASUREMENTS AND OBSERVATIONS Parallax Errors / Recorders / Rejection of Data I Sensitivity I Arithmetic Mean 1 Observations I Sampling I Residual 1 Measurements.	35
CHAPTER 5 TRANSFER AND HANDLING OF DATA Truncation Errors I Round-off Errors I Computation Errors Numerical Integration—Taylor Series I Step Errors I Inherited Errors I Error Analysis of Hybrid Systems I Time Delay as Related to Subsystem Input-Output Errors I Static and Dynamic Errors I Kinematical Errors I Errors in A-D Converter I Errors in D-A Conversion I Sine Wave Conversion I Errors in Data Transmission I Hybrid Computer Solution of Integral Equations I Analog Computer, Multiplexer.	47
CHAPTER 6 INSTRUMENTS AND CONTROLS Functions of an Instrument 1 Systematic Errors 1 Error of Observation / Erratic Errors / Mathematical Models I Time Constant / Frequency Response / Control Instruments I Response of Control Instruments.	57
CHAPTER 7 DATA REPRESENTATION AND RELATED ANALYSIS Linear, Exponential or Power Function / Modification of Equations / Use of Graph Paper / Functional Scale / Periodic Functions 1 Quadratic Form / Graphical Means / Logarithms.	69
CHAPTER 8 DATA ANALYSIS AND CALCULATIONS Model 1 Modeling / System Model 1 Input-Output Models 1 Transfer Function / Lumped Parameters 1 Series Expansion 1 Error of Calculation 1 Approximating Surface Areas I Combined Curve Fitting and Objectives.	79

CHAPTER 9 PROBABILITY AND ERROR ANALYSIS Random Chance / Probability / Normal Distribution / Error Function / Histograms / Probability Distribution Function / Poisson Distribution / Probability Graph Paper / Gaussian Law of Errors / Binomial Distribution / Normal Law of Errors 1 Error Integral.	89
CHAPTER 10 ERROR ANALYSIS BY LEAST SQUARES APPROACH Advantage of Least Squares Method / Disadvantage of Least Squares Method / Procedure for Determinin Least Squares Line I Correlation Coefficient I Standard error of Estimate / Relation of Association of x and y / Nonlinear Relationships / Range / Mean Deviation / Standard Deviation / Variance / Use of Methods / Degrees of Freedom.	101
CHAPTER 11 ADDITIONAL STATISTICAL RELATIONSHIPS Chi-squared Test Chi-Square Values 1 Summary of Chi-square Test / Degrees of Freedom / Poisson Distribution Power Spectral Density.	113
CHAPTER 12 MEASUREMENT AND CONTROL SYSTEMS Linear Differential Equations / Application of Linear Equations / Solving Differential Equations / Transform Method / Laplace Transform Method / Theorem for Laplace Transform / Error Function / Fourier Transforms / Z-Transform / Other Transforms	121
CHAPTER 13 INSTRUMENT AND CONTROLLER RESPONSE Output Response / Function Generation / Dynamic Error / Indicator Response / Transient Response Characteristics I Oscillatory System I Second Order Systems / Feedback Control Loops / Response of Instruments and Controllers / Steady State Response / Superposition and Computation / Impulse Responses.	133

RELIABILITY Series Configuration I Parallel System I Mean Time to Failure I Mean Time Between Failures I Weibull Function I Weighting Functions.	143
REFERENCES	149
APPENDIX	157
INDEX	10