

**MODEL QUESTION PAPER**

**MODIFIED MODEL PAPER**

**I YEAR B.A/B.Sc STATISTICS (With Mathematics Combination)**

**PAPER – II MATHEMATICAL EXPECTATIONS AND PROBABILITY**

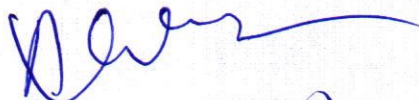
**DISTRIBUTIONS**

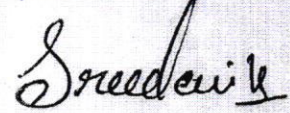
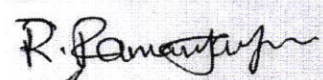
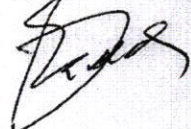
**SEMESTER – II**

Answer any **FIVE** questions. Each question carries equal marks. (5 x 15 =75Marks)

1. (a) Define mathematical expectation and write properties of expectation.  
(b) State and prove Cauchy – Schwartz inequality.
2. (a) Explain Moment Generating function and its properties.  
(b) State and prove Chebychev's inequality.
3. Define Binomial Distribution. Find the first 4 central moments of Binomial distribution.
4. Define Poisson distribution and derive recurrence relation formula for moments.
5. Find the M.G.F. of Negative binomial distribution and also show that Negative binomial distribution is a limiting case of Poisson distribution.
6. Explain Hyper Geometric Distribution and find its mean and variance.
7. Find the C.G.F of Rectangular Distribution and also find variance of Beta Distribution of 1<sup>st</sup> kind.
8. Define Exponential Distribution and its properties.
9. Derive M.G.F., Additive property and applications of Normal Distribution.
10. Define Cauchy distribution and derive its characteristic function.

**Note: Compulsory should give 2 questions from each unit.**

  
C. Dr. N. Viswanath  
Chairman, Board of Studies

Members  
  
Sreedev  
  
R. Ramakrishna  


NO. 1000 (REV. 1-1-60)

STATE OF CALIFORNIA

DEPARTMENT OF REVENUE

SALES TAX

SALES TAX RETURN

For the month ending

1960

1960

1960

1960

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**MODIFIED** MODEL QUESTION PAPER  
**STATISTICS**  
(with mathematics combination)  
Common to B.A./B.Sc.

**SEMESTER – IV**


**PAPER – IV: STATISTICAL INFERENCE**

Answer any **FIVE** of the following.

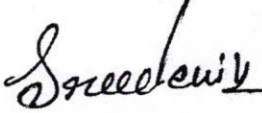

**5 x 15 = 75**

1. Explain the characteristics of a good estimator.
2. State and prove Cramer – Rao inequality.
3. State and prove Neymann – Pearson lemma.
4. Explain the terms (a) Null and Alternative hypothesis (ii) Critical region and (iii) Type-1 and Type-2 errors.
5. Explain the test procedure to test the significant difference between two standard deviations for large samples.
6. Explain Fisher's Z - transformation.
7. Explain t – test to test the significant difference between two means.
8. Explain chi – square test for independence of attributes.
9. Distinguish between parametric and non – parametric tests.
10. Explain median test.

**Note: Compulsory TWO questions from each unit.**

  
(Dr. N. VISWAN)  
Chairman, Board of Studies

Members

  
R Ranganathan  


MEMORANDUM FOR THE RECORD  
DATE: 10/15/54  
SUBJECT: [Illegible]

TO: [Illegible]  
FROM: [Illegible]

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Very truly yours,  
[Illegible Signature]

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**MODEL QUESTION PAPER**  
**STATISTICS**  
**(with mathematics combination)**  
**Common to B.A./B.Sc.**

**SEMESTER – VI**

**PAPER – VII(A): APPLIED STATISTICS**

Answer any **FIVE** of the following.


**5 x 15 = 75**


1. Define Time series. Explain the components of time series. Also explain the uses of time series.
2. Explain link relatives method to measure the seasonal indices.
3. Define Index numbers. Explain the problems involved in the construction of index numbers.
4. Explain the types of index numbers briefly.
5. Explain about CSO.
6. What do you mean by national income? And explain the methods to compute the national income.
7. Explain various mortality rates.
8. Explain various fertility rates.
9. Define life table. Explain the components of life tables and also obtain the relationships between them.
10. Explain the methods to measure the population growth.

**LIST OF PRACTICALS FOR PAPER – VII(A)**

1. Computation of trend by method of least squares
2. Computation of trend by method of moving averages
3. Computation of seasonal indices by ratio – to – trend method
4. Computation of seasonal indices by ratio – to – moving averages method
5. Computation of seasonal indices by link relatives method
6. Computation of weighted and un-weighted index numbers
7. Computation of cost of living index numbers
8. Computation of death rates
9. Computation of birth rates
10. Computation of reproduction rates

**Note: Compulsory should give 2 questions from each unit.**

  
(Dr. N. Viswanath)  
Chairman, Board of Studies

Members  
Sreedevi K  
R. Ramakrishna  




**MODEL QUESTION PAPER**  
**STATISTICS**  
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**SEMESTER – VI**

**PAPER – VII(B): DEMOGRAPHY & VITAL STATISTICS**


Answer any **FIVE** of the following. **5 x 15 = 75**


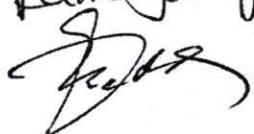
1. Explain about converge and content errors in demographic data.
2. Explain about the use of balancing equations and also about the Chandra Sekharan – Deming formula to check the completeness of registration date.
3. Explain various mortality rates.
4. Explain about the use of Myer and UN indices.
5. Define life table. Explain the components of life tables and also obtain the relationships between them.
6. Explain the terms (i) Stationary and Stable population (ii) Central Mortality Rate and (iii) Force of mortality.
7. Explain the construction of abridged life tables by King's method and Goreville's method.
8. Explain various birth rates.
9. Explain GRR and NRR.
10. Discuss about Crude rate of natural increase and Pearle's Vital index.

**LIST OF PRACTICALS FOR PAPER – VII(B)**

1. Computation of mortality rates
2. Construction of life tables
3. Construction of abridged life tables
4. Computation of birth rates
5. Computation of reproduction rates.

**Note: Compulsory should give 2 questions from each unit.**

  
CDR. N-VISWAN,  
Chairman, Board of Studies

Member  
  
R Ramasubramanian  






**MODEL QUESTION PAPER**  
**STATISTICS**  
(with mathematics combination)  
Common to B.A./B.Sc.

**SEMESTER – VI**                      **CLUSTER – A**  
**PAPER – VIII(A-1): OPTIMIZATION TECHNIQUES**

Answer any **FIVE** of the following.                      **5 x 15 = 75**

1. Discuss the importance of models in the solution of Operations Research problems.
2. Write the scope and applications of O.R in industry and business.
3. Explain (i) Linear Programming Problem                      (ii) Canonical form                      (iii) Characteristics of Standard Form of L.P.P                      (iv) Slack and Surplus Variables
4. Solve the following L.P.P by Graphical Method.

$$\text{Maximize } Z = 4x_1 + 3x_2$$

Subject to

$$2x_1 + x_2 \leq 1000$$

$$x_1 + x_2 \leq 800$$

$$x_1 \leq 400$$

$$x_2 \leq 700$$

$$\text{and } x_1, x_2 \geq 0$$

5. State and prove Fundamental theorem of L.P.P.
6. Use Simplex method to solve the following L.P.P.

$$\text{Maximize } Z = 4x_1 + 10x_2$$

Subject to

$$2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$\text{and } x_1, x_2 \geq 0$$

7. What is degeneracy in L.P.P. How does it resolving.
8. Explain the artificial variable technique. Use the Big M Method to solve the following L.P.P.

$$\text{Maximize } Z = 3x_1 + 5x_2$$

Subject to

$$x_1 + x_2 \geq 2$$

$$x_2 \leq 6$$

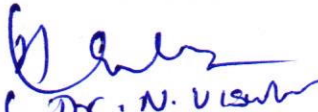
$$3x_1 + 2x_2 = 18$$


$$\text{and } x_1, x_2 \geq 0$$

9. Describe Dual Simplex procedure to solve the L.P.P.
10. Explain (i) Duality                      (ii) Statement of Fundamental theorem of duality

(iii) Show that the dual of the dual is the primal linear programming problem.

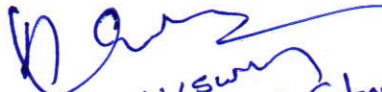
**Note: Compulsory should give 2 questions from each unit.**

  
Cdr. N. V. Singh  
Chairman Board of Studies

  
R. Ramakrishna

**LIST OF PRACTICALS FOR PAPER – VIII(A-1)**

1. Formulation of LPP
2. Solution of LPP by Graphical method
3. Solution of LPP by Simplex method
4. Solution of LPP by Penalty method
5. Solution of LPP by Two – phase Simplex method
6. Solution of LPP by Dual Simplex method

  
Dr. N. Viswanath  
Chairman, Board of Studies

Member  
Sreedev  
R. Ramakrishna  
Joshi

1914-1915

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The University  
of Toronto

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**MODEL QUESTION PAPER**  
**STATISTICS**  
 (with mathematics combination)  
 Common to B.A./B.Sc.

**SEMESTER – VI                      CLUSTER – A**  
**PAPER – VIII(A-2): OPERATIONS RESEARCH**

Answer any **FIVE** of the following.                      **5 x 15 = 75**

- Describe the revised simplex procedure for the solution of linear programming problem.
- Using the bounded variable technique, solve the following L.P.P.

$$\text{Maximize } Z = 3x_1 + 5x_2 + 2x_3$$

Subject to

$$x_1 + 2x_2 + 2x_3 \leq 14$$

$$2x_1 + 4x_2 + 3x_3 \leq 23$$

$$0 \leq x_1 \leq 4$$

$$2 \leq x_2 \leq 5$$

$$0 \leq x_3 \leq 3$$

- Discuss how the transportation problem is a special case of L.P.P. Explain North West Corner Method and Vogel's Method for finding the IBFS of a transportation problem.
- Determine an IBFS to the following transportation problem by using Matrix Minima and Vogel's Methods.

From	To				SUPPLY
	I	II	III	IV	
A	13	11	15	20	2000
B	17	14	12	13	6000
C	18	18	15	12	7000
DEMAND	3000	3000	4000	5000	

- Explain the procedure for Stepping Stone Method.
- Solve the following transportation problem using Vogel's method.

SOURCE	DESTINATION				SUPPLY
	A	B	C	D	
1	11	20	7	8	50
2	21	16	20	12	40
3	8	12	8	9	70
DEMAND	30	25	35	40	

- Define assignment problem. Describe the Hungarian method of solving the assignment problem.
- Using the following cost matrix, determine (i) Optimal job assignment (ii) the cost of assignments.

Mechanic	Job				
	1	2	3	4	5
A	10	3	3	2	8
B	9	7	8	2	7
C	7	5	6	2	4
D	3	5	8	2	4
E	9	10	9	6	10


9. Define sequencing problem and give its assumptions. Explain optimal sequence algorithm for n jobs on 2 machines.
10. Find the sequence that minimizes the total time required for performing the following jobs on 3 machines in the order ABC.

Job	1	2	3	4	5	6
Machine A	8	3	7	2	5	1
Machine B	3	4	5	2	1	6
Machine C	8	7	6	9	10	9

**Note: Compulsory should give 2 questions from each unit.**

#### LIST OF PRACTICALS FOR PAPER – VIII(A-2)

1. Solution of LPP by Revised Simplex method
2. Computation of Initial Basic Feasible Solution for Transportation problem
3. Computation of Optimum solution for Transportation problem by MODI method
4. Computation of Optimum solution for Transportation problem by Stepping Stone method
5. Computation of Optimum solution for Assignment Problem
6. Computation of Optimum solution for Travelling Salesman Problem
7. Computation of Optimal sequencing of N jobs on 2 machines
8. Computation of Optimal sequencing of N jobs on 3 machines

  
 (Dr. N. VISWANATH)  
 Chairman, Bd of Studies

Members  
  
 Sreedevik  
 R Pananjath

It is the policy of the Board of Directors to maintain a strong financial position and to provide a steady stream of income to the shareholders.

Year	Income	Expenses	Net Income
1987	100	80	20
1988	110	90	20
1989	120	100	20
1990	130	110	20
1991	140	120	20

Yearly Comparison of 1991 and 1990

The following table compares the financial performance of the company for the years 1990 and 1991.

The company's income for 1991 was \$140,000, an increase of 7.7% over the \$130,000 reported for 1990. This increase was primarily due to higher sales volume and improved operating efficiency. Expenses for 1991 were \$120,000, an increase of 9.1% over the \$110,000 reported for 1990. The increase in expenses was primarily due to higher depreciation and amortization charges. As a result, net income for 1991 was \$20,000, a decrease of 0% over the \$20,000 reported for 1990.

W. J. Smith  
Chairman, Board of Directors

Member  
Chairman  
Secretary

**MODEL QUESTION PAPER**  
**STATISTICS**  
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**SEMESTER – VI**                      **CLUSTER – B**  
**PAPER – VIII(B-1): ADVANCED EXPERIMENTAL DESIGNS**


Answer any **FIVE** of the following.                      **5 x 15 = 75**

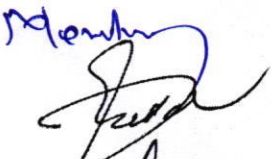
1. Explain about Completely Randomized Design
2. Explain about Latin Square Design
3. Explain about RBD with one and two missing observations.
4. Explain about LSD with one missing observations.
5. Explain analysis of covariance for a one – way classification with one concomitant variable in CRD.
6. Explain analysis of covariance for a two – way classification with one concomitant variable in RBD.
7. Describe the estimation of main and interaction effects and analysis of  $2^2$  factorial experiments.
8. Describe the estimation of main and interaction effects and analysis of  $3^3$  factorial experiments.
9. Explain Balanced Incomplete Block Design (BIBD).
10. Explain Partially Balanced Incomplete Block Design (PBIBD).

**Note: Compulsory should give 2 questions from each unit.**

**LIST OF PRACTICALS FOR PAPER – VIII(B-1)**

1. Completely Randomized Design
2. Randomized Block Design
3. Latin Square Design
4. RBD with one and two missing observations
5. LSD with one missing observations
6. ANCOVA for CRD
7. ANCOVA for RBD

  
(Dr. N. Viswanath)  
Chairman, Bd of Studies

  
Sreedevi  
R Ramaswamy

THE UNIVERSITY OF CHICAGO  
DEPARTMENT OF CHEMISTRY  
LABORATORY OF ORGANIC CHEMISTRY

RESEARCH REPORT  
NO. 1000

REPORT OF THE RESEARCH

The following report describes the results of the research carried out in the Laboratory of Organic Chemistry during the period from January 1, 1950, to December 31, 1950. The work was supported by the National Science Foundation, Office of Naval Research, and the University of Chicago.

SYNOPSIS

1. Introduction

- 1.1. Objectives
- 1.2. Methods
- 1.3. Results
- 1.4. Conclusions

1950  
1951  
1952

(1) [Signature]  
C. R. [Signature]  
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**MODEL QUESTION PAPER**  
**STATISTICS**  
(with mathematics combination)  
Common to B.A./B.Sc.

**SEMESTER – VI**                      **CLUSTER – B**  
**PAPER – VIII(B-2): ACTUARIAL STATISTICS**


Answer any **FIVE** of the following.                      **5 x 15 = 75**

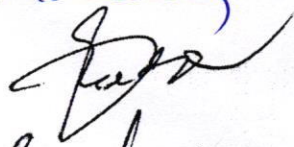
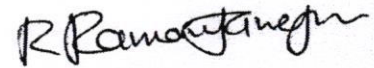
1. Explain the importance of discrete, continuous and mixed probability distributions on the applications of insurance sector.
2. Explain the terms (a) Utility functions (b) Expected Utility criterion (c) Types of Utility function.
3. Explain the properties of premium principles with examples.
4. Explain about the individual risk models.
5. Explain about the construction of life tables with examples and characteristics.
6. Explain the terms (a) Uncertainty of age at death (b) Survival function and (c) Time-until-death for a person.
7. Explain the models for insurance payable at the moment of death and models for insurance payable at the end of the year of death and their relationships.
8. Distinguish between continuous premiums and discrete premiums.

**Note: Compulsory should give 2 questions from each unit.**

**LIST OF PRACTICALS FOR PAPER – VIII(B-2)**

1. Utility functions.
2. Models for individual claims
3. Models for the sum of independent claims
4. Models for insurance payable at the moment of death
5. Models for insurance payable at the end of the year of death
6. Life annuities with periodic payments

  
C.D. N. Uswan  
Chairman, Board of Studies

Members  
  
Sreedevi  
  
R. Ramakrishna

THE UNIVERSITY OF CHICAGO  
DEPARTMENT OF CHEMISTRY  
5700 SOUTH CAMPUS DRIVE  
CHICAGO, ILLINOIS 60637

RECEIVED  
FEBRUARY 10 1964

TO: DR. J. H. GOLDSTEIN

1. The purpose of this experiment is to determine the rate of reaction between hydrogen peroxide and iodide ions in the presence of ceric ions as a catalyst. The reaction is as follows:

$$2H_2O_2 + 2I^- + 2H^+ \rightarrow 2H_2O + I_2$$

2. The rate of reaction is determined by measuring the time required for a fixed amount of iodine to be produced. The iodine is then reacted with a known amount of sodium thiosulfate, which acts as a reducing agent. The reaction is as follows:

$$I_2 + 2S_2O_3^{2-} \rightarrow 2I^- + S_4O_6^{2-}$$

3. The rate of reaction is determined by measuring the time required for a fixed amount of iodine to be produced. The iodine is then reacted with a known amount of sodium thiosulfate, which acts as a reducing agent. The reaction is as follows:

$$I_2 + 2S_2O_3^{2-} \rightarrow 2I^- + S_4O_6^{2-}$$

4. The rate of reaction is determined by measuring the time required for a fixed amount of iodine to be produced. The iodine is then reacted with a known amount of sodium thiosulfate, which acts as a reducing agent. The reaction is as follows:

$$I_2 + 2S_2O_3^{2-} \rightarrow 2I^- + S_4O_6^{2-}$$

RESULTS AND DISCUSSION

TABLE I

Run	[H <sub>2</sub> O <sub>2</sub> ], M	[I <sup>-</sup> ], M	[Ce <sup>4+</sup> ], M	Time, sec
1	0.010	0.010	0.001	120
2	0.010	0.020	0.001	60
3	0.010	0.010	0.002	60
4	0.020	0.010	0.001	30
5	0.010	0.010	0.001	120

1/10/64  
J. H. Goldstein  
J. H. Goldstein  
J. H. Goldstein

1/10/64  
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