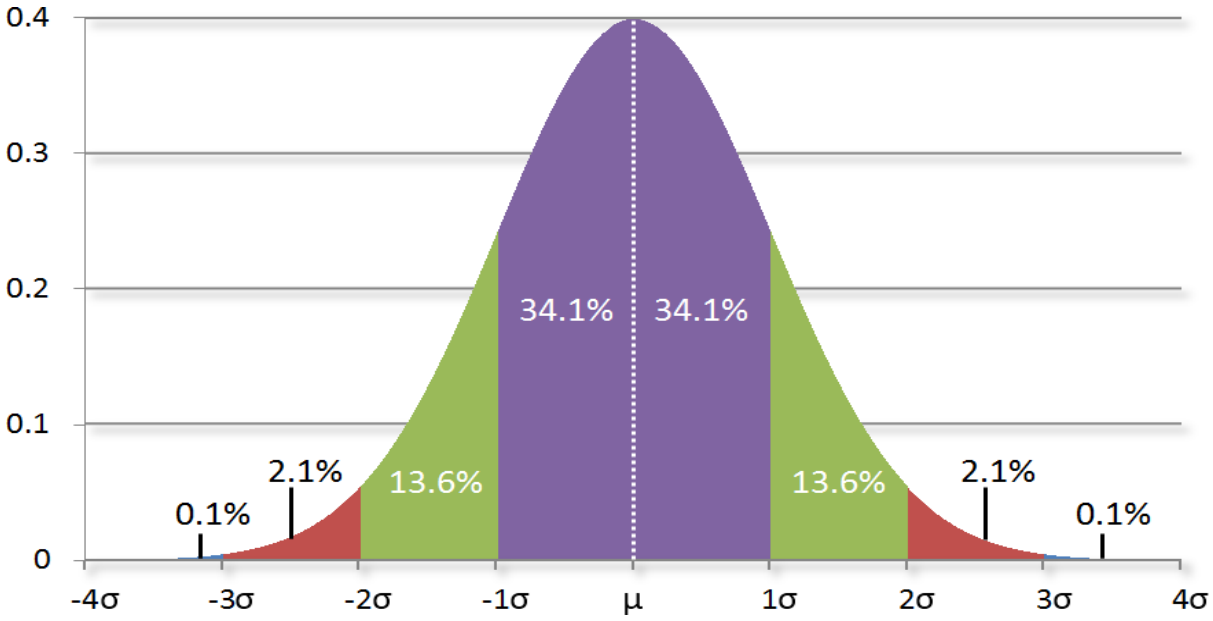
PERIYAR UNIVERSITY

SALEM – 636 011



B.Sc. (STATISTICS)

BACHELOR OF SCIENCE
BRANCH: STATISTICS
SYLLABUS &REGULATIONS
CBCS Pattern

(Effective from the Academic Year 2017-2018)

CONTENTS

PERIYAR UNIVERSITY, SALEM - 11

BACHELOR OF SCIENCE

BRANCH – STATISTICS

CBCS PATTERN (From 2017 – 2018 and onwards)

REGULATIONS

1. OBJECTIVES

Statistics is the key to success in the field of science and technology. Today, the students need a thorough knowledge of fundamental basic principles, methods, interpretation results and a clear perception of the power of statistical ideas and tools to use them effectively in modeling, interpreting and solving the real life problems. Statistics plays an important role in the context of globalization of Indian economy, modern technology, computer science and information technology.

The main objectives of the course is

- To build the basis for promoting theoretical and application aspects of statistics.
- To underline the statistics as a science of decision making in the real life problems in the context of uncertainty.
- To emphasize the relevance of statistical tools and techniques of analysis in the study of inter-disciplinary sciences.

This syllabus is aimed at preparing the students to cope up with the latest developments and compete with the students from other universities and put them on the right track. .

2. ELIGIBILITY CONDITION FOR ADMISSION

Candidates for the admission to the Degree of Bachelor of Science in Statistics shall be required to have passed the Higher Secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereto by the Periyar University, with Statistics / Mathematics / Business Mathematics as one of the subjects.

3. DURATION OF THE COURSE

a) Each academic year will be divided into two semesters. The first academic year will comprise the first and second semester, the second academic year - the third and fourth semester and the third academic year – the fifth and sixth semester.

b) The odd semester comprise of the period from June to November of each year and the even semester from December to May of each year. There shall be not less than 90 working days for each semester.

4. COURSE OF STUDY

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

5. EXAMINATIONS

The theory examination shall be of three hours duration to each paper at the end of each semester. The practical examination shall be three hours duration to each paper at the end of each academic year. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

6. SCHEME OF EXAMINATIONS

The scheme of examinations for different semesters shall be as follows:

Course structure under CBCS (Semester-wise Details)

Branch II STATISTICS

(For the students admitted from the year 2017 – 2018 onwards)

Sem.	Part	Course	Title	Hrs/ week	Credit	Marks			Remarks
						CIA	UE	Total	
I	I	Tamil	Tamil I	6	3	25	75	100	*Examination at the end of second semester
	II	English	English I	6	3	25	75	100	
	III	Core Theory paper I	Descriptive Statistics	6	4	25	75	100	
		Allied I: Theory Paper I	Mathematics I	5	4	25	75	100	
		Allied I: Practical	Mathematics practical*	2	-	-	-	-	
		Core Practical I	Major Practical I*	3	-	-	-	-	
	IV	Value education (Yoga)		2	2	25	75	100	
		Total		30	16	No. of courses – 5		500	
II	I	Tamil	Tamil II	6	3	25	75	100	
	II	English	English II	6	3	25	75	100	
	III	Core Theory Paper II	Probability theory	6	5	25	75	100	
		Allied I Theory Paper II	Mathematics II	5	4	25	75	100	
		Allied I Practical	Mathematics Practical	2	2	40	60	100	
		Core Practical I	Major Practical I	3	4	40	60	100	
	IV	Environmental studies		2	2	25	75	100	
		Total		30	23	No. of courses – 7		700	

CIA – Continuous Internal Assessment; UE – University Examination

Sem.	Part	Course	Title	Hrs/ week	Credit	Marks			Remarks
						CIA	UE	Total	
III	I	Tamil	Tamil III	6	3	25	75	100	**Examination at the end of fourth semester
	II	English	English III	6	3	25	75	100	
		Core Theory Paper III	Distribution theory	5	5	25	75	100	
		Allied II: Theory paper I	Linear Programming and its applications	4	4	25	75	100	
		Core Practical II	Major Practical II**	2	-	-	-	-	
		Allied II: Practical	Operations Research	2	-	-	-	-	
	IV	NMEC-I	Matrix Algebra	2	2	25	75	100	
		SBEC – I	Regression Analysis	3	3	25	75	100	
		Total		30	20	No. of courses – 6		600	
IV	I	Tamil	Tamil IV	6	3	25	75	100	
	II	English	English IV	6	3	25	75	100	
	III	Core Theory paper IV	Theory of Estimation	5	5	25	75	100	
		Allied II: Theory paper II	Decision Theory and its Applications	4	4	25	75	100	
		Core Practical II	Major Practical II	2	4	40	60	100	
		Allied II: Practical	Operation Research	2	2	40	60	100	
	IV	NMEC-II	Numerical methods	2	2	25	75	100	
		SBEC-I	Statistical Forecasting	3	3	25	75	100	
		Total		30	26	No. of courses – 8		800	

CIA – Continuous Internal Assessment; UE – University Examination
NMEC – Non Major Elective Course; SBEC – Skill Based Elective Course

Sem.	Part	Course	Title	Hrs/ week	Credit	Marks			Remarks
						CIA	UE	Total	
		Core Theory Paper V	Sampling Techniques	6	5	25	75	100	
V	III	Core Theory Paper VI	Testing of Hypothesis	6	5	25	75	100	*** Examination at the end of sixth semester
		Core Theory Paper VII	Statistical Quality Control	5	5	25	75	100	
		Core Practical III	Major Practical III***	3	-	-	-	-	
		Core Practical IV	Major Practical IV***	2	-	-	-	-	
		Core Elective I	Stochastic Processes	5	5	25	75	100	
	IV	SBEC-III	Non – Parametric Test	3	3	25	75	100	
		Total		30	23	No. of courses - 5		500	
VI	III	Core Theory Paper VIII	Design of Experiments	5	5	25	75	100	# There is No Examination for Extension Activities
		Core Theory Paper IX	Applied Statistics	5	5	25	75	100	
		Elective NMSDC	Data Analytics with Advanced Tools for Employability	2	2	25	75	100	
		Core Practical III	Major Practical III	2	4	40	60	100	
		Core Practical IV	Major Practical IV	3	4	40	60	100	
		Core Elective II	Actuarial Statistics	5	5	25	75	100	
		Core Elective III	Numerical Analysis	5	5	25	75	100	
	IV	SBEC – IV	Queuing Theory (OR)	3	3	25	75	100	
			Statistical Practical (SPSS)	3	3	40	60	100	
	V	Extension Activities #		-	1	-	-	-	
		Total		30	34	No. of courses -9		800	
		Grand Total		180	142	Total No. of courses - 40		3900	

CIA – Continuous Internal Assessment; UE – University Examination

NMEC – Non Major Elective Course; SBEC – Skill Based Elective Course

Course Structure - BRANCH: STATISTICS

Table showing the courses offered with Credits under various parts

CBCS Pattern w.e.f 2017– 2018 onwards

Part	Course	Semester																		Total		
		I			II			III			IV			V			VI					
		N	H	C	N	H	C	N	H	C	N	H	C	N	H	C	N	H	C	N	H	C
I	Tamil	1	6	3	1	6	3	1	6	3	1	6	3	-	-	-	-	-	-	4	24	12
II	English	1	6	3	1	6	3	1	6	3	1	6	3	-	-	-	-	-	-	4	24	12
III	Core Theory	1	6	4	1	6	5	1	5	5	1	5	5	3	17	15	2	10	10	9	49	44
	NMSDC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	1	2	2
	Core Practical	-	3	-	1	3	4	-	2	-	1	2	4	-	5	-	2	5	8	4	20	16
	Core Elective	-	-	-	-	-	-	-	-	-	-	-	-	1	5	5	2	10	10	3	15	15
	Allied Theory	1	5	4	1	5	4	1	4	4	1	4	4	-	-	-	-	-	-	4	18	16
	Allied practical	-	2	-	1	2	2	-	2	-	1	2	2	-	-	-	-	-	-	2	8	4
IV	Value Education	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2
	Environmental Studies	-	-	-	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2
	SBEC	-	-	-	-	-	-	1	3	3	1	3	3	1	3	3	1	3	3	4	12	12
	NMEC	-	-	-	-	-	-	1	2	2	1	2	2	-	-	-	-	-	-	2	4	4
V	Extension activities*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1*	-	1	1*	-	1
	Total	5	30	16	7	30	23	6	30	20	8	30	26	5	30	23	9	30	34	40	180	142

N – No. of courses; H – Hrs/Week ; C – Credit

* There is no university examination for this course.

7. QUESTION PAPER PATTERN AND EVALUTION FOR ALL COURSES.

7.1. Question Paper Pattern for Core/Allied/Elective/SBEC Papers (Theory):

Time: Three hours **Maximum Marks: 75**

Part - A (10 x 2 = 20)

Answer ALL questions

(Two questions from each unit)

Part - B (5 x 5 = 25)

Answer ALL questions

(One question from each unit with internal choice)

Part - C (3 x 10 = 30)

Answer any THREE questions out of FIVE questions

(One question from each unit)

7.2 Evaluation of Continuous Internal Assessment (CIA)

The components for continuous internal assessment (CIA) are

Test	-	10 marks
Seminar	-	5 marks
Assignments	-	5 marks
Attendance	-	5 marks
Total		25 marks

7.3 Question Paper Pattern for Core and Allied Practical/SBEC- IV(SPSS)

Time: Three hours Maximum: 60 marks

Answer Any THREE questions out of FIVE questions

(One question from each unit)

7.4 Distribution of Marks for Core and Allied Practical/SBEC-IV(SPSS)

University Examination (Written Practical) - 60 marks

Continuous Internal Assessment (CIA) - 40 marks

(Including Practical Record)Total - 100 marks

Evaluation of Continuous Internal Assessment (CIA)

The components for continuous internal assessment (CIA) are

Record	-	25 marks
Test	-	10 marks
Attendance	-	5 marks
Total		40 marks

8. PASSING MINIMUM

The candidate shall be declared to have passed the examination if the candidate secure not less than 30 marks out of 75 marks in the University Examination (UE) in each theory paper and 10 marks (out of 25) in the Continuous Internal Assessment (CIA) in each theory paper.

For the Practical paper, a minimum of 24 marks (out of 60) in the University Examination (UE) and 16 marks (out of 40) in the Continuous Internal Assessment (CIA) is required to pass the examination.

The CIA of each practical paper includes evaluation of record. However submission of record for the University Practical Examination is mandatory.

Examination	**Maximum marks**			**Passing minimum**		
	CIA	**UE**	**Total**	**CIA**	**UE**	**Total**
Theory paper	25	75	100	10	30	40
Practical paper	40	60	100	16	24	40

9. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in the First Class.

All other successful candidates shall be declared to have passed in the Second Class.

Candidates who obtained 75% of the marks in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who pass all the examinations prescribed for the course in the first instance and within a period of three academic years from the year of admission to the course only are eligible for University Ranking.

9.1 Passing Minimum is 40% of the ESE(UE) and also 40% of CIA and also 40% in the total for each of the paper / course.

9.2 Minimum Credits to be earned: 140 Credits
(Credits of Part I and II: Languages; Part III: Major, Elective, Allied; Part –IV: Soft Skills and Part V: Extension activities)

9.3 Marks and Grades:

The following table gives the marks, grade points, letter grades and classification to indicate the performance of the candidate.

Conversion of Marks to Grade Points and Letter Grade (Performance in a Course/ Paper)

Range of Marks	Grade Points	Letter Grade	Description
90 – 100	9.0 - 10.0	O	**Outstanding**
80 – 89	8.0 - 8.9	D+	**Excellent**
75 – 79	7.5 - 7.9	D	**Distinction**
70 – 74	7.0 - 7.4	A+	**Very Good**
60 – 69	6.0 - 6.9	A	**Good**
50 – 59	5.0 - 5.9	B	**Average**
40 – 49	4.0 - 4.9	C	**Satisfactory**
00 – 39	0.0	U	**Re-appear**
ABSENT	0.0	AAA	**ABSENT**

C_i = Credits earned for course **i** in any semester.
G_i = Grade Point obtained for course **i** in any semester.
n refers to the semester in which such courses were credited.

For a Semester:

$$\textbf{GPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the courses}}{\text{Sum of the credits of the courses in a semester}}$$

GRADE POINT AVERAGE [GPA] = $\sum_i C_i G_i / \sum_i C_i$

For the entire programme:

CUMULATIVE GRADE POINT AVERAGE [CGPA] = $\sum_n \sum_i C_{ni} G_{ni} / \sum_n \sum_i C_{ni}$

$$\textbf{CGPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5-10.0	O+	First Class With Exemplary*
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class With Distinction*
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
4.5 and above but below 5.0	C+	Third Class
4.0 and above but below 4.5	C	
0.0 and above but below 4.0	U	Re-appear

*The candidates who have passed in the first appearance and within the prescribed semester of the UG Programme (Major, Allied and Elective Courses Alone) are eligible.

10. MAXIMUM DURATION FOR THE COMPLETION OF THE UG PROGRAMME:

The maximum duration for completion of the UG Programme shall not exceed twelve semesters.

11. COMMENCEMENT OF THIS REGULATION:

The CBCS regulations shall take effect from the academic year 2017-2018 ie. for the students who are admitted to the first year of the course during the academic year 2017-2018 and thereafter.

12. TRANSITARY PROVISION

Candidates who were admitted to the UG course of study prior to 2017-2018 shall be permitted to appear for the examination under those regulations for a period of three years ie., up to and inclusive of the examinations of April/May 2020. Thereafter they will be permitted to appear for the examination only under the regulations then in force.

LIST OF COURSES

1. CORE COURSES: (Theory 9 + Elective 3 + Practical 4): 16

(i) CORE THEORY : 9

1. Descriptive Statistics
2. Probability Theory
3. Distribution Theory
4. Theory of Estimation
5. Sampling Techniques
6. Testing of Hypothesis
7. Statistical Quality Control
8. Design of Experiments
9. Applied Statistics

ii). CORE ELECTIVES: 3

1. Stochastic Processes
2. Actuarial Statistics
3. Numerical Analysis

(iii) CORE PRACTICAL: 4

1. Major practical – I
   (Based on Core theory papers – 1 & 2)
2. Major practical – II
   (Based on core theory papers – 3 & 4)
3. Major practical - III
   (Based on core theory papers – 5,6 & 8)
4. Major practical - IV
   (Based on core theory papers – 7 & 9)

II. ALLIED COURSES (Theory 4 + Practical 2)

(i). ALLIED THEORY: 4

1. Mathematics – I
2. Mathematics – II
3. Linear Programming and its Applications
4. Decision Theory and its Applications.

(ii). ALLIED PRACTICALS: 2

1. Allied I: Mathematics Practical
2. Allied II: Operations Research (Based on Allied theory papers 3 & 4)

III. SKILLS BASED ELECTIVE COURSES: 4

1. Regression Analysis
2. Statistical Forecasting
3. Non-Parametric Tests
4. Queuing Theory (OR) Statistical Practical (SPSS)

IV. NON MAJOR ELECTIVE COURSES: 2

1. Matrix Algebra
2. Numerical Methods

V. VALUE EDUCATION: 1

1. Yoga

VI. ENVIRONMENTAL STUDIES: 1

VII.EXTENSION ACTIVITIES: 1

PERIYAR UNIVERSITY, SALEM – 11

B.Sc., STATISTICS

CBCS PATTERN

STRUCTURE, SYLLABUS AND MODEL QUESTION

(For candidates admitted from 2017-18 onwards)

SEMESTER – I

Sem.	Part	Course	Title	Hrs/ week	Credit	Marks			Remarks
						CIA	UE	Total	
I	I	Tamil	Tamil I	6	3	25	75	100	*Examination at the end of second semester
	II	English	English I	6	3	25	75	100	
	III	Core Theory paper I	Descriptive Statistics	6	5	25	75	100	
		Allied I: Theory Paper I	Mathematics I	5	3	25	75	100	
		Allied I: Practical	Mathematics practical*	2	-	-	-	-	
		Core Practical I	Major Practical I*	3	-	-	-	-	
	IV	Value education (Yoga)		2	2	25	75	100	
		Total		30	16	No. of courses – 5		500	

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - I	SEMESTER – I	P. Code:

DESCRIPTIVE STATISTICS

UNIT – I:

Concepts of Statistical Population and Sample. Measurement of Scale: Nominal, Ordinal, interval, ratio.

Collection and sources of statistical data – Formation of frequency distribution – discrete and continuous – cumulative frequency distribution (O'gives) – Classification and tabulation.

Graphs and Diagrams – Bar diagrams, Histogram, Pie diagram.

UNIT – II:

Univariate data – Measures of Central Tendency – Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean – Inter Relationship between A.M, G.M and H. M – Weighted A.M – properties of a good Average.

UNIT – III:

Measures of dispersion (absolute & relative) – Range, Quartile Deviation, Mean Deviation and Standard Deviation – Inter Relationship between Q.D., M.D., and S.D.

Co-efficient of Variation – Lorenz curve

UNIT – IV:

Moments – Raw moments, Central moments – Relation between raw and central moments – Measures of skewness – Karl Pearson's coefficient of skewness – Bowley's co-efficient of Skewness – Measures of Kurtosis.

UNIT – V:

Correlation – types of correlation – Scatter diagram — Karl Person's co-efficient of correlation – properties – Spearman's Rank correlation co-efficient – Concurrent deviation Method - Correlation co-efficient for grouped data.

Reference Books:

1. Gupta, S.C, and Kapoor, V.K. (2004). Fundamental of Mathematical Statistics (11^{th} – edition),Sultan Chand & Sons, New Delhi.
2. Goon Gupta A.M and Das Gupta, (1994). Fundamentals of Statistics, The World Press Private Limited, Calcutta.
3. S.P.Gupta, (2001). Statistical Methods, Sultan Chand & Sons, New Delhi.

MODEL QUESTION PAPER
PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - I	**SEMESTER - I**	P. Code:

CORE THEORY PAPER – 1
DESCRIPTIVE STATISTICS

Time: 3 Hours **Maximum: 75 Marks**

Part - A (10 x 2 = 20)
Answer ALL questions

1. What is meant by qualitative data?
2. Define primary data
3. What is tabulation?
4. State any two merits of diagrammatic representation.
5. What is a measure of central tendency?
6. Define relative measure.
7. Define skewness.
8. What do you mean by Kurtosis?
9. Define correlation.
10. What is probable error in correlation?

Part - B (5 x 5 = 25)
Answer ALL Questions

11. (a) Distinguish between primary data and secondary data.

Or

(b) Explain any two methods of primary data collection.

12. (a) Explain the four types of classification.

Or

(b) Explain the parts of a good table.

13. (a) List the properties of a good average.

Or

(b) Obtain Median for the following

CI:	0-20	20-40	40-60	60-80	80-100
Frequency:	10	15	26	19	10

14. (a) Explain any two methods of studying skewness.

Or

(b) First three moments of a distribution about the value 4 of the variable are – 1.5, 17 and –30. Find μ_2 and μ_3.

15. (a) Explain the method of studying correlation by scatter diagram method.

Or

(b) Obtain Rank Correlation:

Rank by Judge I:	3	5	4	8	9	7	1	2	6	10
Rank by Judge II:	4	6	3	9	10	7	2	1	5	8

Part – C (3 x 10 = 30)

Answer any THREE questions

16. What are the various methods used for collecting primary data?

17. Explain any four types of Bar Diagrams.

18. Explain the method of drawing Lorenz curve. What are it uses?

19. Obtain the relationship between raw moments and central moments up to 4^{th} order.

20. Show that correlation co-efficient is unaffected by changing origin and scale.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Allied I: Theory- I	SEMESTER – I **ALLIED MATHEMATICS – I** **(Algebra, Calculus, Fourier series)**	P. Code:

Time: 5 Hrs/Week **Max Marks :75**

(For B.Sc Statistics, Physics, Chemistry, Computer Science, Electronics, BCA and Bio-informatics)

UNIT – I:

Characteristic Equation - Eigen Values and Eigen Vectors – Cayley - Hamilton Theorem (Statement only) - Simple Problems

UNIT – II:

Polynomial Equations - Imaginary and Irrational Roots - Transformation of equations - Descarte's Rule of Signs - Problems

UNIT – III:

Radius of Curvature in Cartesian and Polar Co-ordinates – Pedal Equation of a curve – Radius of Curvature in p-r co-ordinates.

UNIT-IV:

Integral Calculus – Integration by parts – Definite integrals and its properties – Reduction formulae for $\int Sin^n x dx$, $\int Cos^n x dx$, $\int tan^n x dx$, $\int_0^{\frac{\pi}{2}} Sin^n x dx$, $\int_0^{\frac{\pi}{2}} Cos^n x dx$, $\int_0^{\frac{\pi}{2}} tan^n x dx$, $\int_0^a x^n e^{ax} dx$, $\int_0^\infty e^{-x} x^n dx$ – Problems.

UNIT – V:

Fourier Series: Definition **–** To find the Fourier Co – efficient of periodic functions of period 2π – even and odd functions – Half range Series - Problems

TEXT BOOKS:-

S.NO	Title of the Book	Author	Publishing Company	Year of Publication
1.	Differential Equations and Laplace Transforms	Dr.P.R.Vittal	Margham Publications, Chennai- 600017.	2002
2.	Allied Mathematics	Dr.P.R.Vittal	Margham Publications, No: 24, Rameswaram Road, T.Nagar, Chennai-600017.	2002
3.	Allied Mathematics	A.Singaravelu	Meenakshi Publishers, No: 120, Pushpa Nagar, Medavakkam, Chennai-601302.	2002

Reference Books:-

S.No	Title Of The Book	Author	Publishing Company	Year Of Publication
1.	Engineering Mathematics	Gunavathi & Thilkavathy	Emerald Publishers, 135, Anna Salai, Chennai- 600002.	1984
2.	Calculus	Dr.P.R.Vittal	Krishana Prakasam Mandir,9,Shivaji road, Meerut(UP)	1994

PERIYAR UNIVERSITY, SALEM - 11

B.Sc., STATISTICS

CBCS PATTERN

STRUCTURE, SYLLABUS AND MODEL QUESTIONS

(For candidates admitted from 2017- 2018 onwards)

SEMESTER – II

Sem.	Part	Course	Title	Hrs/ week	Credit	Marks		
						CIA	UE	Total
II	I	Tamil	Tamil II	6	3	25	75	100
	II	English	English II	6	3	25	75	100
	III	Core Theory Paper II	Probability theory	6	5	25	75	100
		Allied I Theory Paper II	Mathematics II	5	4	25	75	100
		Allied I Practical	Mathematics Practical	2	2	40	60	100
		Core Practical I	Major Practical I	3	4	40	60	100
	IV	Environmental studies		2	2	25	75	100
		Total		30	23	No. of courses - 7		700

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - II	SEMESTER – II **PROBABILITY THEORY**	P. Code:

UNIT –I:

Concepts of Random experiment – Trial – Sample point – Sample space, Event, Algebra of Events, Mutually Exclusive – Exhaustive events, definition of probability, Classical, Statistical and Axiomatic approach – Properties of Probability, Addition theorem - Conditional probability – Multiplication theorem – Baye's theorem – Boole's inequality.

UNIT – II:

Concept of random variables – Discrete random variable, continuous random variables, probability mass function – Probability density function, Distribution function – Properties of distribution function - Independence of random variable.

UNIT – III:

Mathematical expectation of random variables - Properties of mathematical expectation - Moments – Raw moments, central moments – Measures of location and dispersion of a random variable – Tchebychev's inequality and its application.

UNIT – IV:

Moment generating function of a random variable – their properties and its uses – cumulants – Characteristic functions – Properties of characteristic function – simple examples – Inversion theorem (statement only) - Statements and Application of weak law of large numbers.

UNIT – V:

Bivariate distribution – Distribution functions of bivariate random variable and its properties – probability mass and density function, marginal and conditional distributions – Conditional expectation – Concept of regression lines – covariance and correlation

Reference Books

1. S.C.Gupta and V.K. Kapoor (2007). Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publications, New Delhi.
2. J.N.Kapur and H.C.Saxena (1999). Mathematical Statistics – S.Chand and Company Ltd., New Delhi.
3. Marek. Fisz, (1961). Probability Theory and Mathematical Statistics, John Wiley and Sons.
4. Hogg. R. V. and Allen T. Craig (1998). Introduction to Mathematical Statistics.

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - II

SEMESTER - II

PROBABILITY THEORY

P. Code:

Time: 3 Hours **Maximum : 75 marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1. What is a random experiment?
2. What do you mean by mutually exclusive events?
3. Define random variable.
4. What do you mean by pair wise independence of events?
5. Define mathematical expectation of a random variable.
6. Define rth order central moment.
7. Define the moment generating function of the random variable.
8. State the weak law of large numbers.
9. Define the marginal distribution function of the random variable X for the given joint distribution function.
10. Define correlation function.

Part – B (5 x 5 = 25)

Answer ALL questions

11. (a) What are the axioms of probability?

Or

(b) State and prove the total theorem on probability.

12. (a) Define probability density function and state its properties.

Or

(b) Explain the mutually independence of events with an example.

13. (a) State the properties of mathematical expectation.

Or

(b) State and prove the Markov's inequality.

14. (a) State the Inversion theorem on characteristic function.

Or

(b) Find the characteristic function of the Poisson random variable.

15. (a) Define the distribution function of the random vector (X, Y. and state its properties.

Or

(b) Define conditional expectation of X given Y. Also show that E {(X/Y)} = E(X).

Part – C (3 x 10 = 30)

Answer any THREE questions

16. State and prove Baye's theorem on probability.
17. State and prove the properties of distribution function of a random variable X.
18. State and prove Tchebychev's inequality
19. State and prove the properties of characteristic function of a random variable X.
20. Establish the necessary condition for F (x, y) to be a distribution function. Obtain the marginal density functions of the Bivariate normal density function.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER – II

Core Practical - I	**MAJOR PRACTICAL – I**	**P. Code:**

UNIT – I:

Formation of frequency distribution – Computation of Measures of Central Tendencies

UNIT – II:

Calculation of Measures of dispersion– Skewness and Kurtosis

UNIT – III:

Product Moment correlation – Rank correlation – Regression lines of two variables

UNIT – IV:

Rank of the matrix – Inverse of the matrix – Solution of simultaneous equations of three variables using matrix

UNIT – V:

Bivariate Distributions – Marginal and Conditional Distributions (Discrete and Continuous).

Note:

Total	:	100 marks
* University Examination (Written practical)	:	60 ”
Continuous Internal Assessment (Including Practical Record)	:	40 ”

* 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER - II

Core Practical - I

MAJOR PRACTICAL – I

P. Code:

Time: 3 Hours **Maximum: 60 marks**

Answer any THREE questions

All questions carry EQUAL marks.

1. Construct a frequency distribution of the marks obtained by 50 students in Statistics as given below:

42	53	65	63	61	47	58	60	64	45
55	57	82	42	39	51	65	55	33	70
50	52	53	45	45	25	36	59	63	39
65	30	45	35	49	15	54	48	64	26
75	20	42	41	55	52	46	35	18	40

Calculate mean and median of the above.

2. Compute Karl Pearson's Coefficient of Skewness from the following data

Marks	0 -10	10 - 20	20 - 30	30 - 40	40 – 50	50 - 60	60 - 70
No. of students	14	23	35	56	40	20	10

3. Calculate the co-efficient of rank correlation from the following data:

X	: 48	33	40	9	16	16	65	24	16	57
Y	: 13	13	24	6	15	4	20	9	6	19

4. Solve the following equations by matrix inverse method

$$2X_1+X_2+X_3 = 4,\ X_1+X_2+X_3 = 3,\ 2X_1+X_2+3X_3 = 6$$

5. Find the characteristic equation, roots and vectors for the following matrix.

$$A = \begin{matrix} 2 & 4 & 7 \\ 6 & 8 & 9 \\ 4 & 4 & 2 \end{matrix}$$

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Allied I: Theory - II	SEMESTER – II	P. Code:

ALLIED MATHEMATICS – II

(Differential Equations and Laplace Transforms)

(For B.Sc Statistics, Physics, Chemistry, Computer Science, Electronics, and BCA. Major students admitted from the year 2017 - 2018 onwards)

Second / Fourth Semester

Time: 5 Hrs/Week **Max Marks : 75**

UNIT – I:

Second order differential equation with constant coefficients – Particular intergral of the type e^{ax}, cosαx or sinαx, x^n , $e^{\alpha x}$ V where V is any function of cosax or sinax or x or x^2 or xsinax or xcosax.

UNIT – II:

Formation of Partial differential Equation by eliminating arbitrary constants and arbitrary functions – Definitions - Complete, particular, singular and general integrals – Problems.

UNIT – III:

Solutions of standard types of Partial differential equations – Clairaut's Form – Lagrange's linear Partial Differential Equations Pp+Qq=R – Problems.

UNIT-IV:

Laplace transforms – Definition – Standard formula – Elementary theorems - Problems.

UNIT – V:

Inverse Laplace transforms – Standard formula – Elementary theorems – Applications to solving second order differential equations with constant coefficients – Problems.

TEXT BOOKS:-

S.NO	Title of the Book	Author	Publishing Company	Year of Publication
1.	Differential Equations and Laplace Transforms	Dr.P.R.Vittal	Margham Publications, Chennai- 600017.	2002
2.	Allied Mathematics	Dr.P.R.Vittal	Margham Publications, No: 24, Rameswaram Road, T.Nagar, Chennai-600017.	2002
3.	Allied Mathematics	A.Singaravelu	Meenakshi Publishers, No:120, Pushpa Nagar, Medavakkam, Chennai-601302.	2002

Reference Books:-

S.No	Title Of The Book	Author	Publishing Company	Year Of Publication
1.	Engineering Mathematics	Gunavathi & Thilkavathy	Emerald Publishers, 135, Anna Salai, Chennai- 600002.	1984
2.	Calculus	Dr.P.R.Vittal	Krishana Prakasam Mandir,9,Shivaji road, Meerut(UP)	1994

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

ALLIED MATHEMATICS PRACTICAL

(For B.Sc Statistics, Physics, Computer Science, Electronics, BCA and Bio-Informatics from the Academic Year 2017 - 2018)

Allied I: Practical	**I, II, III Units in First / Third Semester** **IV, V Units in Second / Fourth Semester**	**P. Code:**

Max Marks: 60

UNIT I:

Characteristic Equation – Cayley-Hamilton Theorem (Statement Only) - Problems

Unit – II:

n^{th} derivative – Leibnitz Theorem for n^{th} derivative – Problems.

Unit III:

Partial differentiation – Partial derivatives of Higher Orders – Homogeneous functions - Problems

Unit IV:

Scalar Point function – Vector Point function – Gradient of Scalar Point Function – Divergence and of a Vector Point Function – Solenoidal and Irrotational Functions.

Unit V:

Applications to solve the second order differential equations with constant coefficients using Laplace Transforms.

Note: The University Practical Examination will be conducted at the end of the even semester.

Total	:	100 marks
* University Examination (Written practical)	:	60 ”
Continuous Internal Assessment (Including Practical Record)	:	40 ”

* 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

MODEL QUESTION PAPER
PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Allied I: Practical	**SEMESTER - II**	**P. Code:**

MATHEMATICS PRACTICAL - I

Time: 3 Hours **Maximum: 60 marks**

Answer any THREE questions

All questions carry EQUAL marks.

1 a. Find the characteristic equation of the matrix A = $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

b. Verify Cayley Hamilton Theorem for the given matrix A = $\begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$

2 a. If $u = (x-y)^4 + (y-z)^4 + (z-x)^4$ show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = \frac{\partial u}{\partial z} = 0$

b.Verify Euler's Theorem for the given function $u = \tan^{-1}\left(\frac{x-y}{x+y}\right)^{3/2}$

3 a. Find the n[th] derivative of $e^{3x} \sin x \sin 2x \sin 3x$

b. If $y = Sin(m \sin^{-1} x)$ Prove that $(1-x)^2 y_2 - xy_1 + m^2 y = 0$ and $(1-x)^2 y_{n+2} - (2n+1)xy_{n+1} + (m^2 - n^2)y_n = 0$

4 a. Find the gradient of scalar point function $\phi(x, y, z) = x + xy^2 + yz^2$ at the point (1,2,-1)

b. Find the divergence and cure of a vector point function $\bar{F} = xz^3\bar{i} - 2x^2yz\bar{j} + 2yz^4\bar{k}$ at the point (1,-1,1)

5. Solve: $y'' + 4y' + 5y = 4e^{3t}$ given $y(0) = 2$; $y'(0) = 7$ using Laplace Transformation

PERIYAR UNIVERSITY, SALEM - 11

B.Sc., STATISTICS

CBCS PATTERN

STRUCTURE, SYLLABUS AND MODEL QUESTION

(For candidates admitted from 2017 - 18 onwards)

SEMESTER – III

Sem.	Part	Course	Title	Hrs/ week	Credit	Marks			Remarks
						CIA	UE	Total	
III	I	Tamil	Tamil III	6	3	25	75	100	**Examination at the end of fourth semester
	II	English	English III	6	3	25	75	100	
	III	Core Theory paper III	Distribution Theory	5	5	25	75	100	
		Allied II: Theory paper I	Linear Programming and its applications	4	4	25	75	100	
		Core Practical II	Major Practical II**	2	-	-	-	-	
		Allied II: Practical	Operations Research**	2	-	-	-	-	
	IV	NMEC-I	Matrix Algebra	2	2	25	75	100	
		SBEC - I	Regression Analysis	3	3	25	75	100	
		Total		30	20	No. of courses-6		600	

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - III	SEMESTER – III	P. Code:

DISTRIBUTION THEORY

Unit – I:

Univariate discrete distributions – their properties – Uniform, Bernoulli, Binomial, Poisson, Geometric, Hyper geometric and Negative binomial distributions – Limiting form of binomial and Poisson distribution

Unit – II:

Continuous univariate distributions – Uniform – Normal – Exponential-Cauchy - Gamma – Beta distribution – Concepts of lognormal, Pareto, Weibull distributions – their simple applications

Unit – III:

Bivariate normal distributions – marginal and conditional distributions and their properties – Sampling distributions – Standard error – Derived distribution function of random variables – Sampling distribution – students 't' – its properties – Uses.

Unit – IV:

Chi-square Random variable – its distribution, properties of chi-square distribution – Uses of chi-square - F-random variable – distribution of F random variable – its properties and its uses – Relationship between t, F and chi-square distributions.

Unit – V:

Order Statistics – Distribution function of maximum and minimum order statistics – Simple applications – Distribution of r^{th} order statistics and sample median – Simple problems – uses of order statistics.

Reference Books:

1. S.C.Gupta and V.K.Kapoor, (2004), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. V.K. Rohatgi, (1985), An introduction to probability theory and mathematical statistics, Wiley Eastern Ltd., New Delhi.

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - III	SEMESTER – III	P. Code:

DISTRIBUTION THEORY

Time: 3 Hours **Maximum: 75 marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1. What is the range of binomial variable?
2. Write the MGF of Poisson random variable.
3. State the condition for F (x) to be a distribution function.
4. What is the meant by Cauchy distribution?
5. What is sampling distribution?
6. What is standard error?
7. Define chi-square random variable.
8. State any two uses of 'F' statistic.
9. Define order statistics
10. Write down any two uses order statistics

Part – B (5 x 5 = 25)

Answer ALL questions

11. a) Show that mean and variance of the Poisson distribution are equal.

Or

b) Obtain the moment generating function of binomial random variable.

12. a) Find the mean and variance of exponential distribution.

Or

b) Find the MGF of normal distribution.

13. a) Obtain the marginal and conditional distribution function of bivariate normal distribution.

Or

b) State the uses of 't' statistics.

14. a) State the properties of chi-square distribution.

Or

b) What is 'F' random variable? Explain how it is related to't' and chi-square variables.

15. a) Prove that the pdf of first order statistics of an exponential distribution is also exponential.

Or

b) Obtain the mean of the distribution of sample median for U (0,1) population.

Part – C (3 x 10 = 30)

Answer any THREE questions

16. State and prove recurrence relation between moments for the binomial distribution.

17. Determine the characteristic function of normal distribution and hence find mean and variance.

18. Derive the students‘t’ distribution function

19. Drive the chi square distribution function.

20. Derive the p.d.f. of r^{th} order statistics.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Allied II: Theory - I | **P. Code:**

SEMESTER – III

LINEAR PROGRAMMING AND ITS APPLICATIONS - I

Unit – I:

Introduction – Origin – Nature of OR – Structure – Characteristics – OR in Decision making – Models in OR – Phase of OR – Uses and Limitations of OR – LPP- Mathematical formulation of LPP – Graphical Method.

Unit – II:

LPP – Standard form of LPP - Maximization – Minimization – Simplex method – Artificial variable technique – Big-M method – Two phase method.

Unit – III:

Duality in LPP – Formulation of Dual LPP – Primal – Dual relationship – Solving LPP using Dual concepts – Dual simplex method.

Unit – IV:

Transportation problem – Balanced, Unbalanced T.P. – Initial basic feasible solution – North West Corner Rule- Row minima – Column minima – Matrix minima (LCM) – Vogel's approximation method – Optimum solution – MODI method.

Unit – V:

Assignment problem – Introduction – Balanced – Unbalanced – Maximization – Minimization – Hungarian method

Reference Books:

1. Kanti Swarup, P.K.Gupta, Manmohn (1980) – Operations Research, Sultan Chand and sons, New Delhi.
2. J.K. Sharma: (1997), Operations Research and Application, Mc.Millan and Company, New Delhi.
3. Nita H.Shah, Ravi M.Gor, Hardik Soni (2010)- Operations Research, PHI Learning Private Limited, New Delhi.
4. Dr.B.S.Goel & Dr.S.K.Mittal – Operations Research – Pragathi Prakasam Publishers.

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM - 11

Allied II: Theory I

B.Sc. Degree Examination

P. Code:

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER - III

LINEAR PROGRAMMING AND ITS APPLICATIONS -I

Time: 3 Hours **Maximum: 75 Marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1. Define Operations Research.
2. State the canonical form of the L.P.P.
3. State the role of artificial variable in solving a L.P.P.
4. Define degenerate solution of L.P.P.
5. Explain the duality in L.P.P.
6. Write the formulation of Dual L.P.P.
7. State the mathematical form of a transportation problem?
8. What is meant by an unbalanced transportation problem?
9. What is an Assignment Problem?
10. What is meant by balanced and unbalanced Assignment Problem?

Part – B (5 x 5 = 25)

Answer ALL questions

11. a) State some feature of O.R?

Or

b) What are the characteristics of a good model for O.R?

12. a)Explain feasible solution and optimum solution of a L.P.P.

Or

b) State the two basic conditions on which the simplex method is based.

13. a)State and explain dual L.P.P.

Or

b) Write the dual of the primal problem given below:

Minimize $Z = 7 x_1 + 3 x_2 + 8 x_3$

Subject to the constraints,

$8 x_1 + 2 x_2 + x_3 \geq 3$, $3 x_1 + 6 2x_2 + 4x_3 \geq 4$, $4 x_1 + x_2 + 5 x_3 \geq 1$

$x_1 + 5x_2 + 2x_3 \geq 7$ and $x_1, x_2, x_3 \geq 0$

14. a) Explain VAM of finding Initial basic feasible solution of a transportation problem.

Or

b) Explain the degeneracy in transportation problem.

15. a) Explain Hungarian Method of solving a Assignment Problem.

Or

b) Explain the degeneracy in Assignment Problem.

Part – C (3 x 10 = 30)

Answer any THREE questions

16. Explain the applications and use of OR.
17. Explain simplex Algorithm.
18. Prove the theorem "The dual of the dual is the Primal"
19. Explain MODI method of solving a transportation problem.
20. Explain the procedure of maximization and minimization of Assignment problem

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

NMEC : I	SEMESTER – III NON MAJOR ELECTIVE COURSES – I	P. Code:

MATRIX ALGEBRA

Unit- I:

Definition of Matrix – Addition, Subtraction, Multiplication of Matrices

Unit-II:

Transpose of a Matrix – Adjoint of a Matrix – Inverse of the Matrix.

Unit-III:

Symmetric, Skew symmetric, Hermitian and Skew Hermitian Matrix – Problems.

Unit-IV:

Rank of the Matrix- Definition – Finding Rank of the Matrix – Problems up to 3x3 Matrix.

Unit-V:

Cayley Hamilton Theorem (Statement only) – Problems only

Text Books:

Dr.P.R. Vittal -Allied Mathematics - Margham Publications, Chennai-17 (2000)

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM – 11

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

NMEC - I	SEMESTER – III	P. Code:

MATRIX ALGEBRA

Time: 3 Hours **Maximum: 75 Marks**

Section A – (10 x 2 = 20 Marks)
Answer All Questions.
All Questions Carry Equal Marks.

1. Define: Scalar matrix.
2. If A = $\begin{pmatrix} 1 & 3 & 2 \\ 2 & 0 & 3 \\ 1 & -1 & 1 \end{pmatrix}$ then find A^2.
3. Write a short notes on: Transpose of a matrix.
4. If A = $\begin{pmatrix} \propto & \beta \\ \gamma & \delta \end{pmatrix}$ find adj A
5. Define: Hermitian matrix.
6. Define: Symmetric matrix.
7. Define: Rank of matrix.
8. If A = $\begin{pmatrix} 2 & 3 & 4 \\ 3 & 1 & 4 \\ -1 & 2 & 2 \end{pmatrix}$ then find $\rho(A)$.
9. Verify: Cayley Hamilton theorem for matrix A = $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$.
10. State: Cayley Hamilton theorem.

Section – B (5 x 5 = 25 marks)
Answer All Questions

11. (a)If A = $\begin{bmatrix} 5 & 4 & 3 \\ 2 & 1 & 5 \\ 0 & 1 & 2 \end{bmatrix}$, B = $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then find 3A – 4B.

Or

(b) If A = $\begin{bmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ -1 & 1 & 2 \end{bmatrix}$, B = $\begin{bmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$ then show that AB ≠ BA.

12. (a) If B = $\begin{pmatrix} 2 & 1 & 2 \\ 1 & 3 & 4 \end{pmatrix}$, C = $\begin{pmatrix} 3 & -4 \\ 1 & 1 \\ 2 & 0 \end{pmatrix}$, show that $(BC)^T = B^T . C^T$

Or

(b) Find the Adjoint of matrix A = $\begin{pmatrix} -1 & -1 & 3 \\ -2 & 1 & 1 \\ 4 & -5 & 2 \end{pmatrix}$.

13. (a) If $\bar{B}$ = $\begin{pmatrix} -i & 1-i & 2+3i \\ -1-i & -2i & 1 \\ -2+3i & -1 & 0 \end{pmatrix}$, show that $\bar{B}$ is Skew – Hermitian.

Or

(b) If A = $\begin{pmatrix} a & h & g \\ h & b & f \\ g & f & c \end{pmatrix}$, show that A is skew symmetric matrix.

14. (a) Find the rank of matrix A = $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \\ 3 & 6 & 10 \end{pmatrix}$

Or

(b) Find the rank of matrix A = $\begin{pmatrix} 1 & 5 & 9 \\ 4 & 8 & 12 \\ 7 & 11 & 12 \end{pmatrix}$

15. (a) Verify the Cayley – Hamilton's theorem for matrix A = $\begin{pmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{pmatrix}$

Or

(b) Verify the Cayley – Hamilton's theorem for matrix A = $\begin{pmatrix} 1 & 0 & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{pmatrix}$

Find out i) A^{-1} ii) A^4

SECTION C – (3 x 10 = 30 marks)

Answer any THREE questions.

16. Let $f(x) = x^2 - 5x + 6$ find f(A), whose A = $\begin{pmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{pmatrix}$

17 Find the inverse of A = $\begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{pmatrix}$

18. If A = $\begin{pmatrix} \frac{-1}{3} & \frac{2}{3} & \frac{2}{3} \\ \frac{2}{3} & \frac{-1}{3} & \frac{2}{3} \\ \frac{2}{3} & \frac{2}{3} & \frac{-1}{3} \end{pmatrix}$, show that A is orthogonal matrix.

19. If A = $\begin{pmatrix} 3 & -1 & 2 \\ -6 & 2 & -4 \\ -3 & 1 & -2 \end{pmatrix}$ then find the rank of matrix A.

20. Verify the Cayley – Hamilton theorem for a matrix A = $\begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$ and hence find its inverse.

B.Sc. STATISTICS

(For the candidates admitted from 2012 – 2013 onwards)

SBEC- I	SEMESTER – III	P. Code:

REGRESSION ANALYSIS

Unit-I:

Concept of correlation and its types – methods of correlation – Rank Correlation – equal and unequal rank

Unit-II:

Concept of regression – Liner, Non liner regression – Regression line – Regression Coefficient – properties of regression coefficient

Unit-III:

Curve fitting- methods – liner equations – methods of least square.

Unit-IV:

Regression curves – conversion of data into linear form (Power curve, Exponential curves).

Unit-V:

Growth curve fittings – exponential, Gompertz and logistic curves

Reference Books:

1. Fundamentals of Mathematical Statistics, (2000)-S.C. Gupta and V.K. Kapoor.
2. Mathematical Statistics –J.N. Kapoor and H.C. Saxena (1989).
3. Introduction to mathematical Statistics – R.V. Hogg and A.T. Craig (1989).

Note: Question paper may be set irrespective of the units

MODEL QUESTION PAPER
PERIYAR UNIVERSITY, SALEM - 11

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

SBEC- I	**SEMESTER – III**	P. Code:

REGRESSION ANALYSIS

Time: 3 Hours **Maximum: 75 Marks**

SECTION A – (10x2=20 Marks)

Answer ALL questions

1. What are the types of correlation?
2. x: 1 2 3 4 5

   y: 10 15 20 25 30

   Are x and y positively correlated or negatively correlated?
3. What do you mean by "Regression"?
4. State the relationship between correlation coefficient and regression coefficients.
5. Transform the curve of the form $y=a\,e^{bx}$ into linear equation.
6. Find normal equation for fitting a curve of the form $y=ax + bx^2$.
7. What is meant by linear regression?
8. Give one example for linear regression and one example for non-linear regression.
9. State any two uses of curve fitting.
10. State the advantage of principle of least squares method of curve fitting.

SECTION B – (5x5=25 Marks)
Answer ALL questions

11. (a) Explain Scatter diagram method of studying correlation.

    Or

    (b) Explain Spearman's method of finding correlation.
12. (a) State the two-variable regression model and its assumptions.

    Or

    (b) State and two properties regression coefficient and prove one of them.
13. (a) What is meant by curve fitting? Give example.

    Or

    (b) Explain the least squares method of curve fitting.
14. (a) Explain the method of fitting $y= a + bx$ to the data (x_i,y_i) $i=12,...n.$

    Or

    (b) Show that linear regression equation of y on x and the least squares method of fitting equation of the form $y=a+bx$ are one and the same.

15. (a) What are exponential curves? How do reduce them to linear equation?

Or

(b) What are non-linear regression? What method will you use to fit non-linear regression?

SECTION C – (3x10=30 Marks)

Answer any THREE questions

16. Find Karl-Pearson coefficient of correlation and Spearman's coefficient of correlation for the following data and comment on the results.

x: 10 15 20 25 30 28 23 18 17 14

y: 22 24 26 28 30 29 25 20 23 19

17. If the regression of y on x is linear, show that $E(Y/X=x) = \mu_y + \rho \frac{\sigma_y}{\sigma_x}(x - \mu_x)$

Where $E(X) = \mu_x$, $E(Y) = \mu_y$, ρ=correlation coefficient $V(X) = \sigma^2_x$ & $V(Y) = \sigma^2_y$.

18. Explain the method of fitting an equation of the form $y=c+a_1x+a_2x^2+a_2x^3+...+a_nx^n$, using the principle of least squares.

19. Fit $y=a+bx+cx^2$ to the following data and estimate the value of y when x=1996.

x: 1990 1991 1992 1993 1994 1995

y: 10 20 40 65 45 40

20. Fit a curve of the form $y=a\,e^{bx}$ to the following data:

x: 0 2 4

y: 5.012 10 31.62

PERIYAR UNIVERSITY, SALEM - 11

B.Sc., STATISTICS

CBCS PATTERN

STRUCTURE, SYLLABUS AND MODEL QUESTIONS

(For candidates admitted from 2017- 2018 onwards)

SEMESTER – IV

Sem.	Part	Course	Title	Hrs/week	Credit	Marks		
						CIA	UE	Total
IV	I	Tamil	Tamil IV	6	3	25	75	100
	II	English	English IV	6	3	25	75	100
	III	Core Theory paper V	Theory of Estimation	5	5	25	75	100
		Allied II Theory Paper II	Decision Theory and its Applications	5	4	25	75	100
		Core Practical II	Major Practical II	2	4	40	60	100
		Allied II: Practical	Operation Research	2	2	40	60	100
	IV	NMEC – II	Numerical Methods	2	2	25	75	100
		SBEC-II	Statistical forecasting	3	3	25	75	100
		Total		30	26	No. of courses - 8		800

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - IV	SEMESTER – IV	P. Code:

THEORY OF ESTIMATION

Unit – I:

Point Estimation – Distinction between Estimator and Estimate – Properties of Estimators – Concept of Unbiasedness, Consistency, Efficiency and Sufficiency – Statement of Neyman – Factorization theorem – Simple Applications.

Unit – II:

Minimum Variance Unbiased Estimator (MVUE) – Uniqueness property of MVUE – Proof – Lower bound for variance of estimator – Regularity conditions – Cramer – Rao inequality – Statement and proof – Simple problems – Asymptotic efficiency.

UNIT – III:

Sufficient statistic and its properties – Concept of complete sufficient statistics – Simple illustrations – Minimum Variance Bound Estimator (MVBE) – Concept of Blackwellisation – Statement and proof of Rao – Blackwell theorem

Unit – IV:

Methods of estimation – Maximum likelihood estimator (MLE. and their properties – Simple problems on MLE – Method of moments – Simple illustrations – Methods of minimum chi-square and modified minimum chi-square

Unit – V:

Interval estimation – Distinction between point estimation and interval estimation - Confidence interval and confidence limits – Construction of confidence intervals for parameters of Binomial, Poisson, Normal and Exponential distribution.

Reference Books:

1. Rohatgi, V.K. (1988), An introduction to probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi.
2. Lehmann, E.L. (1986), Theory of point estimation (Student edition).
3. Hogg, R.V. and Craig, A.T. (1978) Introduction to Mathematical Statistics, Fourth Edition, Collier Macmillian Publishers.
4. Mood, A.M., Graybill, F. a., and Bies, D.C. (1974), Introduction to the Theory of Statistics, Third Edition, McGrow Hill.
5. Rao, C.R. (1973), Linear Statistical Inference and its Applications, Revised Edition, Wiley Eastern Ltd., New Delhi.

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - IV	SEMESTER – IV	P. Code:

THEORY OF ESTIMATION

Time: 3 Hours **Maximum: 75 Marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1. Define an estimator and estimate
2. State Neyman – Factorization theorem
3. Define MVUE
4. What is asymptotic efficiency?
5. Define complete sufficient statistic
6. What is MVBE?
7. Under what condition least square estimator coincides with MLE?
8. Define maximum likelihood estimator.
9. Outline the need for interval estimation.
10. Define confidence limits.

Part – B (5 x 5 = 25)

Answer ALL questions

11. a) Let $x_1, x_2, \ldots x_n$ be a random sample from the normal population N (μ, 1). Show that $T = \frac{1}{n} \sum_{i=1}^{n} x_i$ is an unbiased estimate of $1 + \mu$.

(Or)

b) Let $x, \ldots x_n$ be a random sample from a population with p.d.f. $f(x: \theta) = \theta\, x^{\theta-1}$, $0 \le x < 1$. Prove that $T = \prod_{i=1}^{n} x_i$ is sufficient for the parameter θ.

12. a) Prove that MVUE is unique

Or

b) Obtain C-R lower bound for the Cauchy population.

13. a) Define sufficient statistic and state its optimal properties.

Or

b) Explain the concept of Blackwellization.

14. a) Explain the method of moments

Or

b) State the properties of MLE.

15. a) Distinguish between point estimation and interval estimation.

Or

b) Explain the concept of confidence interval with suitable example.

PART – C (3 X 10 = 30)

Answer any THREE questions

16. Discuss the desirable properties of a good estimator.
17. State and establish Cramer – Rao inequality
18. State and prove Rao – Blackwell theorem
19. i) Explain the procedure of minimum (χ^2) chi-square method of estimation.

    ii) If X has uniform distribution (a, b) find the estimates for 'a' and 'b' by the method of moments
20. Explain the procedure of finding confidence interval stating clearly the assumptions and give illustration

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Allied II: Theory II	**SEMESTER - IV**	**P. Code:**

DECISION THEORY AND ITS APPLICATIONS

Unit – I:

Game Theory – Introduction – Two person zero sum game: - Maximin – Minimax principle – Game's with saddle points - Game's without saddle points – Dominance property – Graphical solutions of 2 x n and n x 2 Games – Reducing Game problem by LPP.

Unit – II:

Decision theory – Introduction- Types of Decision Making Environment – Decision Making under uncertainty – Maximin criterion – Maximax criterion – Minimax criterion – Laplace criterion – Hurwitz criterion – Decision Making under risk – EMV – EOL – EVPI - Decision Tree Analysis – Concepts only

Unit – III:

Sequencing problem – Problems with n-jobs on two machines – problems with n-jobs on three machines – problems with n-jobs on m-machines

Unit – IV:

Replacement problem – Replacement of items that deteriorate with time – Replacement of items whose maintenance cost increases with time & the values of money remain same during the period and the value of money also changes with time – selection of best machine amongst two.

Unit – V:

Network analysis – Basic concepts – Constraints in network – Construction of network – Critical path method (CPM) - Program Evaluation Review Technique (PERT)

Reference Books:

1. Kanti Swarup P.K. Gupta and Manmohan, (1980), Operations Research, Sultan chand and sons, New Delhi.
2. J.K.Sharma, (1977): Operations Research, Theory & Application – Mc.Millan India Ltd.
3. Nita H.Shah, Ravi M.Gor, Hardik Soni (2010) : Operations Research, PHI Learning Private Limited, New Delhi.

Dr.B.S.Goel & Dr.S.K.Mittal: Operations Research. Pragathi Prakasam Publishers.

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Allied II: Theory II

Branch – Statistics

P. Code:

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER - IV

DECISION THEORY AND ITS APPLICATION

Time: 3 Hours **Maximum: 75 Marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1. What do you mean by two person zero sum game?
2. What is a mixed strategy problem in a game theory?
3. Define expected opportunity Loss.
4. What is expected value of perfect information?
5. State any two assumptions in a sequencing problem.
6. Write the conditions to be satisfied in n-jobs on three machine sequencing problem.
7. What is a replacement problem?
8. Write the condition for the replacement of item when money value remains constant.
9. Explain CPM in a network problem.
10. What is (a) Event (b) Node in a network?

Part – B (5 x 5= 25)

Answer ALL questions

11. a) Solve the following game

		B			
		1	2	3	4
	I	20	15	12	35
A	II	25	14	8	10
	III	40	2	10	5
	IV	-5	4	11	0

Or

b) Solve the following 2 x 2 game

		B	
		B_1	B_2
A	A_1	1	-1/2
	A_2	-1/2	0

12. a) What is Maximax, Minimax criterion in a decision theory problem?

Or

b) The conditional pay offs for each action-event combination are given below. Determine which alternative the businessman should choose, if he adopts the Hurwitch criterion with his degree of optimism being 0.7.

	Event			
Alternative	A	B	C	D
X	8	0	-10	6
Y	-4	12	18	-2
Z	14	6	0	8

13. a) Explain the procedures of solving the sequencing problems with n-jobs or three machines.

Or

b) Solve the following sequencing problem

		Job 1	Job2	Job3
Machine 1	:	8	6	5
Machine 2	:	8	3	4

14 a) Discuss the replacement of items problem when maintenance cost increases with time and the value of money remains the same.

Or

b). a firm is considering replacement of a machine, shows cost price is Rs.12,200 and the scrap value Rs.200. The running costs are found to be as follows:

Year	: 1	2	3	4	5	6	7	8
Running Cost (Rs.):	200	500	800	1200	1800	2500	3200	4000

15. a) Construct the network diagram for the following constraints

A <D, E; B,D <F; C<G; B, G<H; F, G < I

Where A, B, C, D, E, F, G, H, I are the activities.

Or

b) Calculate earliest starting and finishing time for each activity in the following network problem:

Activity	**1 - 2**	**1 - 3**	**2 – 4**	**3 - 4**	**3 – 5**	**4 - 9**	**5 – 6**	**5 - 7**	**6 - 8**	**7- 8**	**8 - 10**	**9 - 10**
Time	**4**	**1**	**1**	**1**	**6**	**5**	**4**	**8**	**1**	**2**	**5**	**7**

Part – C (3 x 10 = 30)

Answer any THREE questions

16. Explain the procedure of solving a game problem by L.P.P.

17. The probability of the demand for Lorries for hiring on any day in a given district is as follows:

No. of Lorries demanded:	0	1	2	3	4
Probability :	0.1	0.2	0.3	0.2	0.2

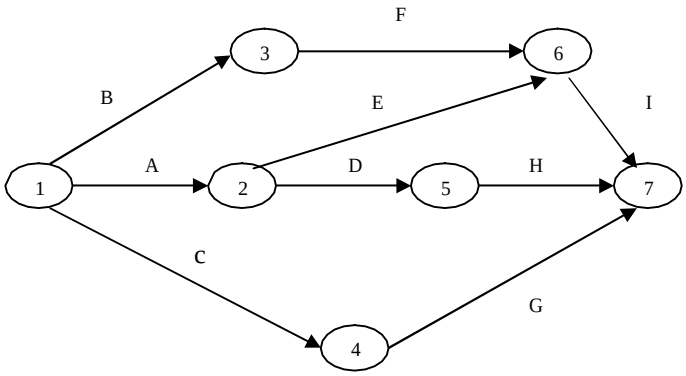
Lorries have a fixed cost of Rs.90 each day and to keep the daily hire charges is Rs.200. If lorry-hire Company owns 4 Lorries, what is its daily expectation? If the company is about to go into business and currently has no Lorries, how many Lorries should it buy?

18. Explain the procedure of solving n jobs on m-machines

19. Explain the procedures of solving replacement problem whose maintenance cost increases with time and the value of money also changes with time.

20. A project is represented by the network shown below and has the following data.

Task	: A	B	C	D	E	F	G	H	I
Least Time	: 5	18	26	16	15	6	7	7	3
Greatest Time : 10	22	40	20	25	12	12	9	5	
Most likely time	: 8	20	33	18	20	9	10	8	4



Calculate

1) Expected task times and their variances.

2) The probability of a node occurring at the proposed completion date if the original contract time of completing the project is 41.5 weeks.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Practical - II	SEMESTER - IV	P. Code:

MAJOR PRACTICAL – II

Unit – I:

Fitting of Binomial, Poisson and Normal distribution. (Not testing the goodness of fit)

Unit – II:

Fitting of curves by the least square method up to polynomial of degree two, ax^b, ae^{bx} and ab^x

Unit – III:

Multiple correlation and Partial correlation – Multiple Regression equations of three variables.

Unit – IV:

Estimation of parameters of statistical model (Multinomial distribution, exponential, normal, binomial and Poisson distributions) – Construction of confidence intervals for mean and variance

Unit – V:

Method of maximum likelihood and Method of moments – Fitting of Binomial, Poisson, Normal, Exponential distributions.

Note:

Total	:	100 marks
* University Examination (Written practical)	:	60 ”
Continuous Internal Assessment (Including Practical Record)	:	40 ”

* 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

MODEL QUESTION PAPER
PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Core Practical - II

Branch – Statistics

P. Code:

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER – IV

MAJOR PRACTICAL – II

Time: 3 hours **Maximum: 60 marks**

Answer any THREE questions

All questions carry EQUAL marks

1. In a population of size N = 5, values of Y are 2,4,6,8,10. Select samples of size 3 and find the sample mean and variance. Prove that sample mean and variance are unbiased estimate of population mean and variance. Further show that variance of the estimate y from sampling without replacement is less than that obtained from sampling with replacement.

2. The following table gives the measure value of timber (y. and they occurred (x) on 15 plot's are selected using SRSWOR. The total cultivated area of the timber is 5124 acres and the total value of the timber is 61,10,000 (x). Obtain the ratio and regression estimate of the total value of the timber on the basis of the sample data given below:

X:	170	47	69	91	126	87	195	255	135
	146	154	146	110	112	153			
Y:	102	14	15	70	95	110	208	110	110
	120	130	79	92	110	128			

3. The weights of a calf taken at weekly intervals are given below. Fit a straight line using the method of least squares and calculate the average rate of growth per week.

Age (X)	:1	2	3	4	5	6	7	8	9
Weight (Y):	52.5	58.7	65.0	70.2	75.4	81.1	87.2	5.5	101.2

4. The data given below represents the frequency of off-spring of classes.

Classes	:	AB	Aβ	αB	αβ
Frequency	:	299	138	185	118
Probability		(2+θ)	(1- θ)	(1- θ)	θ

Estimate the parameter θ, by the method of maximum likelihood and also find out it's S.E.

5. Fit a Poisson distribution for the following data and test the goodness of fit.

X:	0	1	2	3	4	5	6	7	8
f:	210	180	160	93	40	21	8	5	3

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Allied II: Practical	SEMESTER – IV	P. Code:

OPERATIONS RESEARCH

Unit – I:

Linear programming problem – Graphical Method – Simplex Method – Big – Method – Two phase method (Not more than three constraints)

Unit – II:

Transportation Problem – Basic feasible solutions – By NWC rule – Matrix minima – Vogel's Approximation Method – Optimum solution by MODI Method – Balanced & Unbalanced TP. Assignment Problem – Balanced & Unbalanced AP (Hungarian Method).

Unit – III:

Game Theory – Pure and Mixed Strategy situation with and without saddle point - Dominance rule – Graphical method for 2 x n and n x 2 Game.

Unit – IV:

Decision theory - Decision making under deterministic & probabilistic situations – EMV. Sequencing problem n jobs on two machines and n jobs on three machines

Unit – V:

Replacement problem – Items that deteriorate gradually and money value constant with time – Money value changing with time. Network analysis – Critical Path Method (CPM and PERT)

Note:

Total	:	100 marks
* University Examination (Written practical)	:	60 ”
Continuous Internal Assessment (Including Practical Record)	:	40 ”

* 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

MODEL QUESTION PAPER
PERIYAR UNIVERSITY

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Allied II: Practical	**SEMESTER – IV**	**P. Code:**

SECOND ALLIED PRACTICAL
OPERATION RESEARCH

Time: 3 Hours **Maximum: 60 Marks**

Answer any THREE questions
All questions carry EQUAL marks

1. Use penalty method to solve the following LPP.

Maximize $z = 2x_1 + x_2 + x_3$

Subject to $4x_1 + 6x_2 + 3x_3 \leq 8$

$3x_1 - 6x_2 - 4x_3 \leq 1$

$2x_1 + 3x_2 - 5x_3 \geq 4$

and $x_1, x_2, x_3 \geq 0$

2. Obtain the optimum solution to the following transportation problem

		To			Availability
From		7	3	2	2
		2	1	3	3
		3	4	6	5
Demand		4	1	5	

3. Use the notion of dominance to simplify the rectangular game with the following pay off and solve it graphically.

		Player B			
		I	**II**	**III**	**IV**
Player A	1	18	4	6	4
	2	6	2	13	7
	3	11	5	17	3
	4	7	6	12	2

4. A newspaper boy has the following probabilities of selling a magazine

No. of copies sold	10	11	12	13	14
Probability	0.10	0.15	0.20	0.25	0.30

Cost of a copy is 30 paise and sale price 50 paise. He cannot return unsold copies. How many copies should be ordered?

5. A capital equipment costs initially Rs.18, 000. Its annual operating costs and the fall in its resale value over the years are given below. Find out the optimum replacement period and the average annual cost for the replacement period.

Year :	1	2	3	4	5	6	7
Resale value (Rs.):	16000	14300	12850	11600	10500	9500	8550
Running cost (Rs)	800	950	1150	1400	1700	2100	2600

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

NMEC- II	SEMESTER - IV NUMERICAL METHODS	P. Code:

Unit- I:

Solution of algebraic and Transcendental Equations – Bisection Methods – Newton – Raphson's Method

Unit-II:

Finite difference – Definition – First difference – Higher differences – Difference tables – expression of any value of Y in terms of the initial value Y_0 and differences.

Unit-III:

Newton Forward difference – Simple Problems

Unit-IV:

Newton Backward difference – Simple Problems

Unit-V:

Central differences – Properties of the operator D – Simple problems

Text Books:

1. Introductory methods of Numerical Analysis – 4th ˙ S.S Sastry- Prentice Hall of India Pvt Ltd, New Delhi.
2. Numerical Methods in Science and Engineering – 2nd Edition (revised) - Dr.M.K.Venkataraman - The National Publishing company, Chennai

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM – 11

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

NMEC-II	SEMESTER – IV	P. Code:

NUMERICAL METHODS

Time: 3 Hours **Maximum: 75 Marks**

Section A – (10 x 2 = 20 Marks)
Answer All Questions.
All Questions Carry Equal Marks.

1. State the Newton – Raphson formula.
2. Find the interval in which the root of $x^3 - 9x + 1 = 0$ lies?
3. Prove that $\Delta^2 y_0 = y_2 - 2y_1 + y_0$.
4. Prove that $E = e^{hD}$.
5. Write down the Newton's forward difference formula.
6. If $x = 42$, $x_0 = 40$, $h = 5$ then find p.
7. Write down the Newton's backward difference formula.
8. Write down the difference table for the following data.

x:	0	1	2	3
y:	1	3	9	31

9. Define: First Order central difference.
10. Prove that $\delta = E^{1/2} - E^{-1/2}$

Section – B (5 x 5 = 25 marks)

Answer All Questions

11. (a)Use bisection method to find a real root of the equation $x^3 - x - 1$

Or

(b)Show that Newton – Raphson formula to find $\sqrt{a}$ can be expressed in the form $x_{n+1} = \frac{1}{2}\left[x_n + \frac{a}{x_n}\right]$, n = 0, 1, 2.

12. (a) Prove that $\Delta^4 y_0 = y_4 - 4y_3 + 6y_2 - 4y_1 + y_0$.

Or

(b) Prove that i) $E = 1 + \Delta$ ii) $\mu = \sqrt{1 + \frac{1}{4}\delta^2}$.

13. (a) Find the cubic polynomial which takes the following values: y(1) = 24, y(3) = 120, y(5) = 336 and y(7) = 720.

Or

(b) Using Newton's forward formula find the value of y when x = 21 from the following

x:	20	23	26	29
y:	0.34	0.39	0.44	0.48

15. (a) From the following table, estimate the value of y when x = 65.

x:	31	41	51	61	71
y:	46	66	81	93	101

Or

(b) Find the value of y at x = 28 from the following data.

x:	20	23	26	29
y:	0.3420	0.3907	0.4384	0.4848

15. (a) Write down central difference table upto δ^6 .

Or

(b) Prove that $\Delta = \nabla E = \delta E^{1/2}$.

SECTION C – (3 x 10 = 30 marks)

Answer any THREE questions.

16. Use the Newton – Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$.

17 Find the missing term in the following table.

x:	0	1	2	3	4
y:	1	3	9	-	81

18. From the following data, find θ at x = 43

x:	40	50	60	70	80	90
y:	184	204	226	250	276	304

19. Estimate the population for the year 1995 from the following:

Year:	1921	1931	1941	1951	1961
Population: (in thousands)	46	66	81	93	101

20. Obtain central difference table for the following data.

Year(x):	1891	1901	1911	1921	1931
f(x):	46	66	81	93	101

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

SBEC- II	SEMESTER – IV	P. Code:

STATISTICAL FORECASTING

Unit – I:

Concept of partial correlation – simple application

Unit – II:

Concept of multiple correlation – simple illustration

Unit – III :

Regression coefficients and its properties

Unit – IV:

Concept of multiple regression – simple problem

Unit – V:

Fitting of multiple regression lines and estimations (three variables only)

Reference Books:

1. S.C.Gupta and V.K.Kapoor (2004): Fundamentals of Mathematics Statistics, Sultan Chand and Sons, New Delhi.
2. J.N.Kapoor and H.C.Sexana (1989) : Mathematical Statistics, sultan Chand and sons, New Delhi.

Note: Question paper may be set irrespective of the units

MODEL QUESTION PAPER
PERIYAR UNIVERSITY, SALEM – 11

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

SBEC-II	SEMESTER – IV	P. Code:

STATISTICAL FORECASTING

Time: 3 Hours **Maximum: 75 Marks**

Section A – (10x2=20 Marks)
Answer All Questions.
All Questions Carry Equal Marks.

1. Mention the use of studying partial correlation.
2. Write the formula for $r_{23.1.}$
3. Define multiple correlation
4. If r_{12}=0.77, r_{13}=0.72 and r_{23}=0.52. Calculate $R^2_{1.23.}$
5. Write the two regression equation.
6. If regression coefficient of X on Y and Y on X are -0.48 and -0.9 respectively. Calculate correlation coefficient of X and Y.
7. Write the formula for $b_{12.34\ldots n}$ $\Delta b_{21.34\ldots n}$.
8. What is primary and secondary subscript?
9. Write the equation of plane of regression of X_1 on X_2 and X_3.
10. Write the error of estimate of trivariate distribution.

Section – B (5x5=25 marks)

Answer All Questions

11. (a) For a trivariate distribution prove that

$$R_{12.3} = \frac{r_{12} - r_{13}r_{23}}{\sqrt{1-r_{13}^2}\sqrt{1-r_{23}^2}}$$

Or

(b) From the heights (X_1), weights (X_2. and ages (X_3) of a group of students the following correlation coefficient were obtained r_{12} = 0.75, r_{23} = 0.54, r_{31} = 0.43. Calculate partial correlation coefficient.

12. (a) Express multiple correlation in terms of total and partial correlations.

Or

(b) Derive the multiple correlation coefficient of X_1 on X_2 and X_3.

13. (a) Write short notes on regression equation.

Or

(b) State the properties of regression coefficient.

14. (a) State the properties of residuals.

Or

(b) Explain the multiple regression of variables.

15. (a) Prove the identify

$b_{12.3}b_{23.1}b_{31.2} = r_{12.3}r_{23.1}r_{31.2}$

Or

(b) Given the values

$\sigma_1=2$, $\sigma_2=\sigma_3$, $r_{12} = 0.7$ $r_{23} = r_{31=0.5}$ find $b_{12.3}$ and $b_{13.2}$.

SECTION C – (3 x 10 = 30 marks)

Answer any THREE questions.

16. Show that the correlation between the residuals $X_{1.23}$ and $X_{2.13}$ is equal and opposite that between $X_{1.3}$ and $X_{2.3}$.

17 If $1-R^2_{1.23} = - (1-r^2_{12}) (1-r^2_{13.2})$ deduce

(a) $R_{1.23} \geq r_{12}$

(b) $R^2_{1.23} = r^2_{12}+r^2_{13}$ if $r_{23} =0$

(c) $1-R^2_{1.23} = \dfrac{(1-\rho)(1+2\rho)}{(1+\rho)}$ provided all coefficient of few order are equal to ρ.

18. Calculate the correlation coefficient and find the two lines of regression from the following data. Find the estimate of Y when X =66.

X:	57	58	59	59	60	61	62	64
Y:	67	68	65	68	72	72	69	71

19. Obtain the equation of the plane of regression of X_1 on X_2X_3 … Xn.

20. Find the regression equation of X_1 on X_2 and X_3 given the following results.

$\bar{X}_1$ 28.02 $\bar{X}_2 = 4.91$ $\bar{X}_3 = 594$, $\sigma_1 = 4.42$ $\sigma_2 = 1.1$ $\sigma_3 = 85$

$r_{12} = 0.8$ $r_{23} = -0.56$ $r_{31} = -0.4$.

PERIYAR UNIVERSITY, SALEM - 11

B.Sc., STATISTICS

CBCS PATTERN

STRUCTURE, SYLLABUS AND MODEL QUESTIONS

(For candidates admitted from 2017- 2018 onwards)

SEMESTER – V

Sem.	Part	Course	Title	Hrs/ week	Credit	Marks			Remarks
						CIA	UE	Total	
V	III	Core Theory Paper V	Sampling Techniques	6	5	25	75	100	**Examination at the end of sixth semester
		Core Theory Paper VI	Testing of Hypothesis	6	5	25	75	100	
		Core Theory Paper VII	Statistical Quality Control	5	5	25	75	100	
		Core Practical III	Major Practical III***	3	-	-	-	-	
		Core Practical IV	Major Practical IV***	2	-	-	-	-	
		Core Elective I	Stochastic Processes	5	5	25	75	100	
	IV	SBEC-III	Non – Parametric Test	3	3	25	75	100	
		Total		30	23	No of course - 5		500	

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - V	SEMESTER – V	P. Code:

SAMPLING TECHNIQUES

Unit – I:

Concept of sampling and population: Need for sampling – Design, Organization and execution of sample survey – Principal steps in sample surveys – preparation of questionnaire and schedules – Pilot survey – Sampling and Non-sampling Errors – Limitations of sampling.

Unit – II:

Sampling from finite population – Simple Random Sampling with and without replacement – Unbiased estimate of mean and Variance – finite population correction – Estimation of standard error from a sample – Determinations of sample size – Simple Random Sampling for attributes.

Unit – III:

Stratified Random Sampling: Concept of stratifying factor - Unbiased estimate of the mean and variance of the estimated mean – Proportional and optimum allocation – Relative precision of stratified random sampling and simple random sampling

Unit – IV:

Ratio and regression estimators (based on simple random sampling only) – concept of Auxiliary variate – Ratio estimators – Bias of Ratio estimates – Variance of the ratio estimates – comparison of Ratio estimator with mean per unit.

Regression Estimators: Linear regression estimate, Regression estimate with pre assigned ‘b’ and regression estimates computed from sample.

Unit – V:

Systematic sampling: Estimation of the mean and variance of the estimated mean – comparison of simple, stratified and systematic sampling – circular systematic sampling.

NSSO and its functions – Other agencies undertaking sample surveys.

Reference Books

1. W.G.Cochran (1985) Sampling Techniques, Wiley Eastern Ltd, New Delhi.
2. S.C. Gupta and V.K.Kapoor (2007), Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
3. Goon. A.M., Gupta. M.K, B.Das Gupta. Fundamentals of Statistics.

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - V | **SEMESTER - V** | **P. Code:**

SAMPLING TECHNIQUES

Time: 3 Hours **Maximum: 75 marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1. Define: Population and sample.
2. Define: Sampling error.
3. What is meant by a SRSWOR?
4. Compare the variances of SRSWR Vs SRSWOR.
5. What is meant by stratified random sampling?
6. State any two advantages of stratified random sampling.
7. Define the confidence limits of Y and R.
8. Define V($\hat{R}$).
9. State any two merits of systematic sampling.
10. The systematic sampling gives more precise estimate of the population mean as compared with SRSWOR if and only if _____

Part – B (5 x 5 = 25)

Answer ALL questions

11. a) Explain any two non-sampling errors.

Or

b) State the limitations of sampling.

12. a) Explain random number method of selecting SRS

Or

b) Explain the merits of SRS

13. a) Prove E ($\overline{y}_{st}$) = $\overline{Y}$

Or

b) Find V ($\overline{y}_{st}$) prop.

14. a) Explain the conditions under which the ratio estimator is a best linear unbiased estimator

Or

b) Derive $V(\overline{Y}_{lr})$

15. a)Explain the method of selecting a systematic sample.

Or

b) Distinguish between stratified random sampling and systematic random sampling.

Part – C (3 x 10 = 30)

Answer any THREE questions

16. Explain the principal steps involved in a sample survey.

17. Prove that in SRSWOR, the variance of the sample mean is given by,

$$V(\overline{Y_n}) = \frac{S^2(N-n)}{nN}$$

18. Discuss proportional and optimum allocation in stratified random sampling.

19. Discuss the bias of the ratio estimate.

20. Prove $\text{var}(\overline{y_{st}}) \leq \text{var}(\overline{y_{sys}}) \leq \text{var}(\overline{y_n})_R$

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Course -VI	SEMESTER – V	P. Code:

TESTING OF HYPOTHESIS

UNIT – I:

Statistical Hypothesis – Simple and composite hypothesis – Critical Regions – Types of errors – Level of Significance – Size and power of the test – Most powerful (MP) test – Neymann – Pearson Lemma – UMP test – Simple problems.

UNIT – II:

Testing of Significance – Large sample and small sample tests – Normal test for mean, variance, proportion and coefficient of correlation – Small sample tests based on t, F for testing mean and variance – Paired t test.

UNIT – III:

Likelihood Ratio (LR) test – Procedure and simple applications – Properties and use of LR test – Relationship between testing of hypothesis and confidence interval.

UNIT – IV:

Analysis of variance (ANOVA) – concept and example – Explanation ANOVA for one way and two – Classifications – Procedures and inference – Chi Square test for Variance, Goodness of fit and independence of attributes.

UNIT – V:

Sequential analysis – Need for Sequential rules – Wald's sequential Probability Ratio Test (SPRT) – Average Sample Number (ASN. and Operating Characteristic (OC) functions – Simple illustrations.

References Books:

1. Rohatgi, V.K. (1988), An introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi.
2. Lehmann, F.L.(1986), Testing of Statistical Hypothesis (Student edition).
3. Hogg, R.V. and Craig, A.T. (1978), Introduction to Mathematical Statistics, Fourth edition, Colliar Mac.Millan Publishers.
4. Mood, A.M., Graybill, F.F. and Boes, D.C.(1974), Introduction to the Theory of Statistics, Third Edition, Mcgraw Hill.
5. Rao, C.R. (1973), Linear Statistical Inference and its Applications, Revised edition, Wiley Eastern Ltd., New Delhi.

MODEL QUESTION PAPER
PERIYAR UNIVERSITY

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - VI	**SEMESTER – V**	**P. Code:**

TESTING OF HYPOTHESIS

Times: 3 Hours **Maximum: 75 marks**

Part – A (10 x 2 – 20)

Answer ALL question

1. Define a statistical hypothesis?
2. What do you mean by Critical Region?
3. Distinguish between small sample and large sample test
4. What is the importance of paired t-test?
5. Define LR test
6. State any two uses of LR test?
7. Define analysis of variance
8. What is contingency table?
9. What is meant by sequential analysis?
10. Define an OC function of a SPRT.

Part – B (5 x 5 = 25)

Answer ALL questions

11. a) Explain the two types of errors in hypothesis testing.

Or

b) Distinguish between MP test and UMP test.

12. a) Describe the t-test procedure for the testing the equality of mean of two normal Populations

Or

b) Discuss the F-test for testing the equality of variances of two normal populations.

13. a) State the properties of LR test

Or

b) Explain paired t-test procedure.

14. a) Outline the procedure of ANOVA of one-way classification

Or

b) Explain the χ^2 test procedure for testing the independence of attributes

15. a) What is average sample number? What purpose does this serve in SPRT?

Or

b) Explain the need for sequential rules.

Part – C (3 x 10 = 30)

Answer any THREE questions

16. State and prove Neyman-Pearson Lemma. Mention its importance.

17. Explain the large sample test procedure for testing the equality of proportions for unequal sample size from two populations.

18. Explain the relationship, between testing of hypothesis and confidence interval giving example.

19. Derive the analyze of variance for two way classification stating clearly its assumptions

20. Explain the procedure of SPRT and state its OC and ASN functions.
    Mention the importance of SPRT.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Course -VII	SEMESTER – V **STATISTICAL QUALITY CONTROL**	P. Code:

Unit – I:

Basic concepts of quality – Meaning of quality – Quality of design – Quality of conformance – Specification of quality concepts of S.Q.C. – Causes of variation

Unit – II:

Process control – Control chart – Basis of control chart – uses - Rational subgroups – Control charts for variables ($\overline{X}$, R and S – Charts) – Sloping control Charts – Uses of Control Chart.

Unit – III:

Control charts for Attributes (P, np, c for fixed and varying sample sizes) – comparison of control charts for variable and attributes – Applications of theory of runs in quality control.

Unit – IV:

Product control – Acceptance sampling – Sampling inspection by attributes – Producer's and consumer's risk, AQL, LTPD, IQL – Single, Double sampling plan procedure, OC, AOQ, AOQL, ASN and ATI curves

Unit – V:

Sequential sampling plan procedure – estimation of parameters – OC, AOQ, ASN curves, multiple sampling, comparison between single, double and multiple sampling

Reference Books:

1. M.Mahajan (2001), Statistical quality control, Dhanpat Rai & co (p) Ltd., Delhi.
2. S.C.Gupta, V.K.Kapoor, (2007), Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
3. A.J.Duncan, (1974), Quality control and industrial statistics, Irwin inc. Homewook
4. E.L.Grant and R.S.Leavenworth (1991), Statistical Quality Control, Mc-Graw-Hill, New york.

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Course -VII	**SEMESTER – V**	P. Code:

STATISTICAL QUALITY CONTROL

Time: 3 Hours **Maximum: 75 Marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1) What are the objectives in quality control?

2) Write a note on process specification?

3) Define process control in manufacturing product

4) What are the factors needed while selecting a sub group?

5) Write two applications of C-Chart

6) Write the 3 σ - control limits for number of defective charts.

7) Define producer's risk.

8) What do you mean by a double sampling plan?

9) Define OC-function of a sequential sampling plan.

10) Mention the ASN function for sequential sampling plan.

Part – B (5 x 5 = 25)

Answer ALL questions

11. a) Explain the various steps in quality control programme.

Or

b) Explain the following terms

i) Standard specification

ii) Customer specification

12. a) What do you understand by control charts in statistical quality control.

Or

b) Explain briefly about detecting lack of control in X & R – Charts.

13. a) Explain the construction of control limits for P-Chart.

Or

b) Distinguish between control chart for variables and attributes.

14. a) Write short note on the following

i. a Q L, (ii)LTPD in an acceptance sampling procedure.

Or

b) How to determine the consumer's risk in single sampling plan?

15. a) Explain briefly the sequential sampling inspection plan.

Or

b) How to form the OC-function of a sequential sampling plan?

Part – C (3 x 10 = 30)

Answer any THREE questions

16. Explain in details of specification of quality.

17) Explain the concept of sloping control chart and how to estimate tolerance spread in machining operations.

18) Explain in details the theory of runs in quality control

19) Discuss the double sampling procedure and how to obtain OC-curve in this plan.

20) Obtain the OC & AOQ curves for sequential sampling plan.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Elective - I	SEMESTER – V	P. Code:

STOCHASTIC PROCESSES

Unit – I:

Definition of Stochastic Processes – Classification of Stochastic Processes according to time parameter space and state space – Examples of Stochastic Processes

Unit – II:

Markov Chains – Definitions and examples – Higher transition probabilities – Chapman - Kolmogorov equation – Classification of States – Limiting behaviour (concept and applications only)

Unit – III:

Stationary processes and time series – Strict and wide Sense stationary models of time series – Concept of spectrum of time series

Unit – IV:

Poisson Processes – Poisson process and related distributions – Birth-death processes – Simple examples

Unit – V:

Markov process with continuous state space – Brownian movement – Wiener process – Differential equation for a Wiener process – Kolmogorov equations – first passage time distribution for Wiener process – Distribution of the maximum of a Wiener process – Distribution of the first passage time to a fixed point

Note: Emphasis should be only on the concepts, Statement and Applications of major theorems and results on the topics mentioned in the syllabus.

Reference Books:

1. S. Karlin, H.M. Taylor, (1966) : First Course in Stochastic Processes, Academic Press.
2. J. Medhi (1982): Stochastic Processes, Wiley Eastern Ltd, New Delhi.
3. N.U. Prabhu, (1965): Stochastic Processes, Mac.Millan, New York.

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PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Elective - I	SEMESTER – V	P. Code:

STOCHASTIC PROCESSES

Time: 3 Hours **Maximum: 75 marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1. What is a random variable?
2. Define a stochastic process.
3. State the markov property.
4. Define (i. absorbing state (ii) Transient state.
5. Define a stationary process.
6. What is a wide sense stationary?
7. Define a birth process.
8. State any two postulates of poison process.
9. Define Brownian movement
10. What is Wiener process?

Part – B (5 x 5 = 25)

Answer ALL questions

11. a) Explain state space and parametric space with an example.

Or

b) Explain how you classify the stochastic process w.r.t. state and parametric spaces.

12. a) Define markov chain and give an example.

Or

b) What do you mean by stochastic matrix?

13. a) Show that poison process is not stationary process.

Or

b) Show that first order markov process is a co-variance stationary.

14. a) What are the properties of Poisson process?

Or

b) Show that the interval between two successive occurrences of a Poisson process $\{N(t)\}$ having parameter λ has a negative exponential distribution with mean $1/\lambda$

15. a) Write a note on Markov process with continuous states space

Or

b) Describe first passage time distribution for Wiener process

Part – C (3 x 10 = 30)

Answer any THREE questions

16. Explain the stochastic process with

(i) Discrete valued continuous time parametric space

(ii) Continuous valued discrete time parametric space, giving suitable example for each.

17. State and prove Chapman-Kolmogorov equation.

18. Show that moving average process is co-variance stationary.

19. Derive the differential equations satisfied by a Birth-Death process.

20. Obtain the Kolmogorov equation

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

SBEC- III	SEMESTER – V	P. Code:

NON-PARAMETRIC TESTS

Unit – I:

Introduction of non-parametric test – its comparison with parametric test – Advantage and limitations of non-parametric tests

Unit – II:

Test for randomness – Run test – Test for rank correlation co-efficient – Sign test.

Unit – III:

Comparison of two populations: median test – Mann Whitney U test – Wilcoxon signed rank test for paired observations.

Unit – IV:

Comparison of several populations: Median test for several samples – Kruskal Walli's test – Friedman ANOVA.

Unit – V:

Testing of goodness of fit by Kolmogorov – Smirnov test – chi-square test for uniformity of data – Distinction between non-parametric and distribution free tests.

References Books:

1. J.D.Gibbons (1976): Non-parametric methods for quantitative analysis, New York.
2. J.V.Desphande, A.P.Gune, A.Shanubhogur: Statistical Analysis of non-normal data.
3. Richard I. Lerin: Statistics for Management, Practice Hall of India, New Delhi.

Note: Question paper may be set irrespective of the units

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SBEC- III	SEMESTER – V NON – PARAMETRIC TESTS	P. Code:

Time: 3 Hours **Maximum:** 75 Marks

SECTION A – (10x2=20 Marks)

Answer all the questions

1. What do you mean by non – parametric test?
2. When do you apply non – parametric test?
3. Define a run?
4. Write the rank correlation coefficient formula.
5. What is meant by two – sample problem?
6. For paired observations, what are the non – parametric tests available?
7. What are the non – parametric tests that are used to compare three or more populations?
8. Write down the formula for H – statistic.
9. What is the purpose of Smirnov test?
10. Give to applications of Chi square distribution one for parametric test and another for non – parametric test.

SECTION B – (5x5=25 Marks)

Answer ALL questions

11. (a) State the assumptions of Non-Parametric tests.

    Or

    (b) What are the limitations of Non-parametric tests

12. (a) Explain the run test for randomness.

    Or

    (b) Compare t-test and sign test.

13. (a) Explain the median test.

    Or

    (b) Distinguish between U-test and Wilcoxon signed rank test.

14. (a) Explain the role of ranks in non-parametric tests.

    Or

    (b) Explain median test for K samples and compare it with median test for 2 samples.

15. (a) Explain goodness of fit test by Kolmogorov - Simonov.

Or

(b) What are distribution free tests?

SECTION C – (3x10=30 Marks)

Answer any THREE questions

16. Distinguish between parametric and non-parametric tests.

17. Explain the test for rank correlation coefficient.

18. Discuss the Mann-Whitney U test and its importance.

19. The following are the final examination grades of sample from three groups of students who were taught German by three different methods.

Method I: 94, 88, 91, 74, 87, 97

Method II: 85, 82, 79, 84, 61, 72, 80

Method III: 89, 67, 72, 76, 68

Apply suitable non-parametric test for testing the null hypothesis that the three methods are equally effective.

20. Explain Chi square test for K proportions.

PERIYAR UNIVERSITY, SALEM - 11

B.Sc., STATISTICS

CBCS PATTERN

STRUCTURE, SYLLABUS AND MODEL QUESTIONS

(For candidates admitted from 2017 - 2018 onwards)

SEMESTER – VI

Sem.	Part	Course	Title	Hrs/ week	Credit	Marks		
						CIA	UE	Total
VI	III	Core Theory Paper VIII	Design of Experiments	5	5	25	75	100
		Core Theory Paper IX	Applied Statistics	5	5	25	75	100
		NMSDC	Data Analytics with Advanced Tools for Employability	2	2	25	75	100
		Core Practical III	Major Practical III	2	4	40	60	100
		Core Practical IV	Major Practical IV	3	4	40	60	100
		Core Elective II	Actuarial Statistics	5	5	25	75	100
		Core Elective III	Numerical Analysis	5	5	25	75	100
	IV	SBEC-IV	Queuing Theory (OR)	3	3	25	75	100
			Statistical Practical (SPSS)	3	3	40	60	100
	V	Extension Activities		-	1	-	-	-
		Total		30	34	No. of courses - 9		800
		Grand Total		180	142	No. of courses - 40		3900

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - VIII	SEMESTER – VI	P. Code:

DESIGN OF EXPERIMENTS

UNIT – I:

Basic principles of experimental design – Replication Randomization and local control – Transformation of data and its need.

UNIT – II:

Uniformity trials – LSD test – SNK test – Duncan's multiple range test – Turkeys (HSD) test – Basic designs – Completely Randomized design (CRD. and its Analysis.

UNIT – III:

Randomized Block Design (RBD. and their analysis – Missing plot technique for RBD (one and two missing values) – Latin Square Design (LSD. and its analysis – Missing plot technique

UNIT – IV:

Factorial Experiments: Concept of main effects and interactions pxq, 2^2, 2^3 and principle of confounding. (Concepts Only)

UNIT – V:

3^2 Factorial Experiment – Need and analysis of split – plot design (two factors only – main plot treatments with RBD layout)

Reference Books:

1. S.C.Gupta & V.K.Kapoor (2007), Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. A.M.Goon M.K.Gupta and B.Das Gupta (1994), Fundamentals of Statistics V-II, The world press Ltd., Calcutta.
3. M.N.Das and N.C.Giri, (1998), Design and Analysis of experiments, Wiley Eastern Ltd, New Delhi.

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PERIYAR UNIVERSITY

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - VIII

SEMESTER - VI

DESIGN OF EXPERIMENTS

P. Code:

Time: 3 Hours **Maximum: 75 Marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1) State the basic principles of experimental design

2) Define local control

3) What is Turkey's test

4) What are uniformity trials?

5) Define Randomized block design

6) Write down the formula for estimating a missing value in RBD.

7) State any two advantages of factorial experiments.

8) What do you mean by confounding?

9) Define split plot design

10) What is 3^2 factorial experiment

Part – B (5 x 5 = 25)

Answer ALL Questions

11. a) Explain the need for transformation of data

Or

b) Describe Randomization

12. a) Explain least significant difference test

Or

b) State any five advantages of CRD.

13. a) Explain the analysis of RBD

Or

b) Explain how the randomization principle is done in the construction of LSD with an example.

14. a) Define main effect and interaction effect in 2^2 factorial experiment.

Or

b) Distinguish between partial and total confounding.

15. a)Explain strip-plot design with two factors.

Or

b) Define main effect & interaction effect in a 3^2 factorial experiment.

Part – C (3 x 10 = 30)

Answer any THREE questions

16) Discuss square root and Angular transformations of data

17). Describe the analysis of Completely Randomized Design

18) Describe the analysis of RBD with one missing observation.

19) Sketch the analysis of 2^3 factorial experiments.

20) Explain, in detail, the analysis of 3^2 factorial experiment.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Course -IX	SEMESTER – VI	P. Code:

APPLIED STATISTICS

Unit – I:

Concept of time series – Source of time series data – Component of time series – Additive and Multiplicative models – Resolving the components of time series – Trend – Methods of measuring trend – Semi average method – Method of moving average – Method of least squares – First order & second order polynomials and logistic curves

Unit – II:

Seasonal variation – Seasonal index – Methods of measuring seasonal index – Simple average method – Ratio to moving average - Ratio to trend method – Link relatives method – Cyclical variation – Measurement of cyclical variation – Method of periodogram analysis – Auto regression series of first order and second order – Auto correlation and correlogram analysis – Random components -Variate difference method.

Unit – III:

Basis of Index Numbers – Definition – uses - Problems in the construction – Different types of Index Numbers – Simple Index Numbers – Weighted Index Numbers – Laspeyre's Index Numbers – Paasche's Index Numbers – Fisher's Index Numbers – Marshall & Edge worth Index Numbers – Dorbish & Bowley's Index Numbers

Unit – IV:

Optimum tests of Index Numbers – Time reversal test – Factor Reversal Test – Circular Test – Chain base Index Number – Conversion of FBI into CBI and Vice versa – Uses of Index Numbers - Wholesale price Index Numbers (Concept only)

Unit – V:

Cost of living Index Numbers – Methods of construction – Aggregate method – Family budget method – splicing and deflating – Base shifting – Uses of cost of living Index Numbers.

Reference Books:

1. A.M.Goon M.K.Gupta and B.Das Gupta (1994), Fundamentals of Statistics V-II, The world press Ltd., Culcutta.
2. Croxton : Applied General Statistics.
3. S.C.Gupta, V.K.Kapoor, (2007):Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi

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B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Course - IX	**SEMESTER – VI**	P. Code:

APPLIED STATISTICS

Time: 3 Hours **Maximum 75 Marks.**

Part – A (10 x 2 = 20)

Answer ALL questions

1) What do you mean by time series Analysis?

2) State the models used in a time series data

3) Define Auto Correlation.

4) What do you mean by periodogram?

5) Give the definition of an Index Number.

6) What are weighted Index Numbers?

7) Define circular test

8) Explain how the base year for the construction of Index Number is selected?

9) What do you mean by 'Base Shifting'?

10) State the errors involved in the construction of cost of living Index Number.

Part – B (5 x 5 = 25)

Answer ALL questions

11. a) Explain the Semi-Average method for fitting a trend line

Or

b) Explain the procedure of deciding about the type of the trend line or curve suitable for a given time series data.

12. a) Obtain the value of r_k for the first order auto-regressive series.

Or

b) Explain briefly the periodogram analysis.

13. a) Prove that Fisher's Index Number lies between Laspeyre's and Paasche's index numbers.

Or

b) Explain the sampling error of an Index Number.

14. a) Explain Time Reversal and Factor Reversal Tests with an example.

Or

b) State the uses of Index Numbers.

15. a) What do you mean by splicing and deflating of Index Numbers.

Or

b) Outline the uses of cost of Living Index Numbers.

Part – C (3 x 10 = 30)

Answer any THREE questions

16) Explain briefly the component of a time series data.

17) Describe variate difference method.

18) Explain briefly the problems involved in the construction of Index Number

19) The following table gives the average wholesale prices of four groups of commodities for the year 1999 to 2003. Compute chain base Index Numbers

Commodity	1999	2000	2001	2002	2003
A	2	3	4	2	7
B	3	6	9	4	3
C	4	12	20	8	16
D	5	7	18	11	22

20) Explain the problems in the constructions of cost of Living Index Numbers and state its uses.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER – VI

Core Elective - II

ACTUARIAL STATISTICS

P. Code:

UNIT - I:

Present value and accumulated value at fixed rate and varying rates of interest – effective rate of interest corresponding to a nominal rate of interest and vice-versa – Simple problems – annuity – types of annuities excluding perpetuity – derivation of the formula for a_n%, s_n%, $a^{¨}_n$% and $s^{¨}_p$% simple problems.

Unit – II:

Derivation of the formula for $a^{(p)}_n$%, $s^{(p)}_n$%, $a^{··(p)}_n$% and $s^{··(p)}_n$% simple problems – redemption of loan by uniform early payment – definitions of sinking fund – redemption of loan by a sinking fund (uniform early payment) simple problems.

Unit – III:

Mortality table: Definition- Uses – mentioning the types and the construction of a mortality table – complete and incomplete mortality table – computing the probabilities of survival and death using LIC (1970-1973) Mortality table- defining expectation of life, complete expectation of life and central death rate – simple problems.

Unit – IV:

Principles of Insurance – Types of assurance – temporary assurance, pure endowment assurance, endowment assurance and whole life assurance – Expressions for present values of assurance benefits under temporary assurance, pure endowment assurance, endowment assurance and whole life assurance plans – simple problems

Unit – V:

Definitions of premium, Natural premium level, Annual Premium, Net Premium and Office Premium – Expressions for level annual premium under temporary assurance, pure endowment assurance, endowment assurance and whole life assurance plans – simple problem involving the calculations of level annual present annual premium, office premium and the four types of plans only.

Reference Books:

1.Mathematics Basis of Life Insurance – Insurance Institute of India.

2.Mathematics of Finance – Scheme Series.

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B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Elective - II	**SEMESTER – V**	P. Code:

ACTUARIAL STATISTICS

Time: 3 Hours **Maximum: 75 marks**

Section – A (10 x 2 = 20)

Answer ALL questions

1. Define immediate annuity.
2. What is an effective rate of interest?
3. What is sinking fund?
4. What is Redemption of Loan?
5. What is the difference between complete and curtate expectation of life?
6. State any two uses of mortality table.
7. Define Endowment Assurance.
8. What is meant by whole life Assurance?
9. Define natural premium.
10. What is office premium?

Section – B (5 x 5 = 25)

Answer ALL questions

11. a) The compound interest on Rs.8,000/- in two years at a certain rate is Rs.820/- and in 3 years it is Rs.1261 at the same rate. Find the rate of interest.

Or

b) Derive the relation between effective rate and nominal rate and vice versa.

12. a) Find the present value of an immediate annuity of Rs.600/- p. a. payable half-yearly for 20 years on the basis of the effective rate of 6% p. a.

Or

b. a sinking fund is set up by uniform payments made at the end of each year, to provide a capital of Rs.3,500/- at the end of 20 years, money in the fund accumulating at 10% p. a. What is the uniform payment required? What is the position of the fund at the end of 8 years?

13. a) Fill in the blanks in a portion of life table given below:

Age in years	l_x	d_x	p_x	q_x	L_x	T_x	e^0_x
4	95000	500	?	?	?	4850300	?
5	?	400	?	?	?	?	?

Or

b) Fill up the blanks in the following portion of a life table.

Age x	**Lx**	**Dx**	**qx**	**px**
10	1000000	-	.00409	-
11	-	-	.00370	-
12	-	-	-	.99653
13	-	-	-	.99658
14	-	-	.00342	-

14. a)Express the present value of temporary assurance in term of commutation functions.

Or

b) What is the principle of insurance?

15. a) What are natural premiums?

Or

b) What are the consequences of level premium system?

Section – C (3 x 10 = 30)

Answer any THREE questions

16. Explain in detail, different types of Annuities.

17. A loan of Rs.7500/- is made subject to repayment by 15 level annual payments, the first to be made at the end of 6 years. If rate of interest of 10% is to be earned, find the level annual payment. What is the principal contained in the (i) 1^{st} payment and (ii) 5^{th} payment?

18. Describe the method of construction of mortality table.

19. Drive the expression for Endowment Assurance in terms of communication functions.

20. Explain any three types of Life Assurance plans

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Elective - III	SEMESTER – VI	P. Code:

NUMERICAL ANALYSIS

UNIT - I:

Solution of Algebraic and transcendental equations – Method of successive bisection – Method of Regula-Falsi – The Secant method – Newton – Raphson iterative method.

UNIT – II:

Finite Differences: Definition and properties of Forward Difference Operator, Backward Difference Operator and Shift Operator – Relations between them – nth differences of polynomials – Difference Equations.

UNIT – III:

Interpolation with equal and unequal intervals: Newton – Gregory forward Interpolation and Backward Interpolation formula for equal intervals – Lagrange Interpolation formula for unequal intervals.

UNIT – IV:

Numerical Differentiation: Numerical Differentiation based on Newton's Forward and Backward Interpolation formulas – Computation of Second order derivatives numerically.

Unit – V:

Numerical Integration: General quadrature for equidistant ordinate – Trapeziodal rule – Simpson 1/3 and 3/8 rules- Weddle's rule – Simple applications.

Reference Books:

1. G.Shankar Rao, Numerical Analysis (New Age International Publications)
2. S.S.Sastry,(2010),Introductory Methods of Numerical Analysis(Prentice Hall).
3. K.E. Aitkinson, An introduction to Numerical Analysis (John Wiley and sons)
4. V.Rajaraman, Computer Oriented Numerical Methods (Prentice Hall).
5. P.Scheild, (1968), Numerical Analysis (Schaum Series).

MODEL QUESTION PAPER
PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Elective -III	SEMESTER - VI NUMERICAL ANALYSIS	P. Code:

Time : 3 Hours **Maximum : 75 marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1) Define polynomial of degree 'n' in x?

2) Define Bisection method?

3) What is meant by shift operator?

4) Write any two properties of the operators E and Δ.

5) What are the methods involving equispaced arguments in interpolation?

6) What are the assumptions of Lagrange's interpolation technique?

7) Under what situations Newton-Gregory forward and backward formula is used?

8) Write the formula for Newton's backward formula.

9) What is mean by Trapezoidal Rule?

10) Define the term error of approximation.

Part – B (5 x 5 = 25)

Answer ALL questions

11. a) Describe the method of Regula-Falsi position to solve an equation f(x) = O

Or

b. apply Newton Raphson's formula to find the root of $x_4 - x = 10$ which is nearer to x = 2.

12. a) Discuss briefly the shift operator.

Or

b)If f(x) is a rational integral (or polynomial) function of degree n in x, then prove that nth difference of this polynomial is constant.

13.a) Show that Lagrange's formula can be evolved by equating $(n+1)^{th}$ divided difference of f(x) to zero if f (x) is a polynomial of degree n.

Or

b) Interpolate f (2) from the following data.

x	: 1	2	3	4	5
f(x)	: 7	?	13	21	37

14. a) Find the first derivative of the function given below at the point x = 1.2.

x	:	1	2	3	4	5
f(x)	:	0	1	5	6	8

Or

b) Derive the formula for differentiation of Newton's forward difference upto first derivative only.

15. a) Derive the expression for Simpson's one-third rule

Or

b) Explain the concept of general quadrature for equidistant ordinate.

Part – C (3 x 10 = 30)

Answer any THREE questions

16) Derive the formula for Newton-Raphson method for the solution of Algebraic equations.

17) Find the function whose first difference is

(i. ax + b, (ii) e^x, (iii) e^{a+bx}

18) Derive the formula for Newton-Gregory Backward interpolation formula for equal intervals.

19) Given the following pairs of values of x and y = f (x)

x	:	1	2	4	8	10
y = f(x):		0	1	5	21	27

Determine numerically the first derivative at x = 4

20. Calculate by Simpson's 1/3rd rule an approximate value of $\int_{-3}^{3} x^4 \, dx$ by taking seven equidistant ordinates.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

SBEC - IV | **SEMESTER – VI** | **P. Code:**

QUEUEING THEORY

UNIT – I:

Queuing system – Kendal's terminology – Classification of States - Poisson axioms.

UNIT – II:

Distribution of arrival and departure under Poisson queues.

UNIT – III:

Pure Birth – Death process – transisent state and steady state solution

UNIT – IV:

M/M/1; ∞/FIFO queuing Model – steady state solution – Averages – Little's formula

UNIT – V:

M/M/1;N/FIFO queuing model – steady state solution – Averages – Simple problems.

Reference Books:

1. Kanti Swarup, P.K.Gupta and Man Mohan (1985) : Operations Research, Sultan Chand & Sons, New Delhi.

2. P.K.Gupta and D.S.Hira : Operations Research .S.Chand and Co, Ltd., New Delhi.

Note: Question paper may be set irrespective of the units.

MODEL QUESTION PAPER
PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core SBEC - IV	SEMESTER - VI	P. Code:

QUEUEING THEORY

Time : 3 Hours **Maximum : 75 marks**

Part – A (10 x 2 = 20)

Answer ALL questions

1. Define State Space?
2. What do you mean by a queue?
3. What is non – Markovian queue?
4. Write the Poisson axioms of Markovian queue?
5. Write a note on service channel.
6. What do you mean by transient state?
7. What is the expected waiting time/unit in the queueing system?
8. Define traffic intensity.
9. What is (M/M/1) : (N/FIFO)?
10. What is P_n in (M/M/1) : (N/FIFO)?

Part – B (5 x 5 = 25 Marks)

Answer ALL questions

11.(a) Explain briefly about waiting lines with examples.

(OR)

(b) Mention some applications of queueing system.

12 (a) Write a short note on Markovian queue.

(OR)

(b) Explain briefly how Poisson distribution is useful in queueing theory.

13. (a) Differentiate between steady state and transisent state.

(OR)

(b) Prove that the distribution of arrival follows Possion distribution.

14.(a) Explain (M/M/1) : (∞/FIFO).

(OR)

(b) State advantageous of Little's formula.

15.(a) Find the expected number of customers in the system for (M/M/1) : (N/FIFO).

(OR)

(b) Find the value of P_0 for (M/M/1) :(2/FIFO) if $\lambda = 0.2$, $\mu = 1$.

Part – C (3 x 10 = 30)

Answer any THREE questions

16) Explain any three characteristics of queueing system.

17) Differentiate between Markovian and Non – Markovian queue.

18) Explain pure death process.

19) Find the probability of n customers in the system for (M/M/1) : (∞/FIFO).

20) Explain briefly about (M/M/1) : (N/FIFO).

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

SBEC - IV

SEMESTER – VI

P. Code:

STATISTICAL PRACTICAL (SPSS)

UNIT – I:

Diagrammatic Representation of Data: Simple Bar Diagram, Multiple Bar Diagram, Line Diagram, Multiple Line Diagram, Area Diagram, Histogram, Pie Diagram.

UNIT – II:

Descriptive Statistics: Mean - Median and Mode (Individual Series, Discrete Series & Continuous Series) - Skewness and Kurtosis (Individual Series, Discrete Series & Continuous Series).

UNIT – III:

Correlation and Regression: Correlation Coefficient – Rank Correlation Coefficient – Regression Lines.

UNIT – IV:

Test of Significance: Test of Significance for Single Mean – Test of Significance for Difference of Mean - Test of Significance for Difference of Mean (Paired Data) – Chi – Square Test for Independent of Attributes – F – Test.

UNIT – V:

Non – Parametric Tests: Run Test – Mann Whitney U Test – Wilcoxon Signed Rank Test – Krushkal Wallis H Test.

Note :

Total	:	100 marks
* University Examination (Written practical)	:	60 ”
Continuous Internal Assessment (Including Practical Record)	:	40 ”

* 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Practical - III	SEMESTER – VI MAJOR PRACTICAL – III	P. Code:

Unit – I:

Simple random Sampling – Drawing sample from the population with and without replacement – Estimation of population mean, total, variance, and its S.E. – Stratified random Sampling : Allocation, Estimation of mean, variance of the population mean – Variance of the estimator of mean under proportional and optimal allocations.

Unit – II:

Test of significance: Large sample - Single proportion- difference of proportions – Single mean – difference of two means – correlation coefficient – Chi square test for independence of attributes

Unit – III:

Test of significance: Small sample test – t test for single mean – difference of two means – paired t test – F test for equality of two variances

Unit – IV:

Analysis of CRD, RBD and LSD - Missing plot techniques in RBD and LSD with one missing observation

Unit – V:

Analysis of factorial experiments 2^2 and 2^3 using Yates Algorithm – Analysis of 3^2 factorial experiments

Note :

Total	:	100 marks
* University Examination (Written practical)	:	60 ”
Continuous Internal Assessment (Including Practical Record)	:	40 ”

* 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

MODEL QUESTION PAPER
PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Practical -III	SEMESTER – VI MAJOR PRACTICAL - III	P. Code:

Time: 3 Hours **Maximum: 60 marks**

Answer any THREE questions

All questions carry EQUAL marks

1. Let x have a pdf of the form $f(x,\theta) = (1/\theta)\, e^{-x/\theta}$, $0 < x < \infty, \theta > 0$

   To test $H_o : \theta = 2$, Vs $H_1 : \theta = 1$ use the random sample x_1, x_2 of size 2 and define a critical region : $w : \{(x_1, x_2)\} : 9.5 \leq x_1 + x_2\}$

   Find (i) Power of the test

   (ii) Significance level of the test

2. The following table gives the number of good and bad parts produced by each of three shifts in a factory:

Shift	Good	Bad	Total
Day	900	130	1030
Evening	700	170	870
Night	400	200	600
Total	2000	500	2500

Is there any association between the shift and the quality of parts produced?

3. The sales data of an item in six shops before and after a special promotional campaign are as under:

Shops :	**1**	**2**	**3**	**4**	**5**	**6**
Before Campaign:	53	28	31	48	50	42
After Campaign :	58	29	30	55	56	45

Can the campaign be judged to be a success? Test at 5% level of significance.

4. The yields of 6 varieties in 4 replicate experiments, for which one value is missing is given below. Estimate the missing value and analyze the data

Blocks	**Treatments**					
	1	**2**	**3**	**4**	**5**	**6**
1	18.5	15.7	16.2	14.1	13.0	13.6
2	11.7	-	12.9	14.4	16.9	12.5
3	15.4	1.6	15.5	20.3	18.4	21.5
4	16.5	18.6	12.7	15.7	16.5	18.0

5. Analyze the following 2^2 factorials experiments and give your inference.

Blocks	**Yields**			
I	**1**	**k**	**P**	**kp**
	23	25	22	38
II	**p**	**1**	**K**	**kp**
	40	26	36	38
III	**1**	**k**	**Kp**	**p**
	29	20	30	20
IV	**kp**	**k**	**P**	**1**
	34	31	24	28

B.Sc. STATISTICS

(For the candidates admitted from 2017 – 2018 onwards)

Core Practical - IV	SEMESTER – VI MAJOR PRACTICAL – IV	P. Code:

Unit – I:

Construction of control charts for variables: $\bar{X}$, R and S charts. Control charts for attributes of fixed and varying sample size – p, np and C charts.

Unit – II:

Acceptance samplig plan for attributes: single sampling plan – OC, AOQ, ASN and ATI curves; Double sampling plan – OC, AOQ, ASN and ATI curves

Unit – III:

Estimation of trend by moving averages, least square methods – First degree and second degree polynomials - Computation of quarterly and monthly trends

Unit – IV:

Estimation of seasonal indices by simple average method - Ratio-to-trend, Ratio-to-moving Average and link relative methods

Unit – V:

Weighted Index Numbers – Laspeyre's – Paasche's – Fisher's – Marshall & Edge worth – Dorbish & Bowley's methods - Optimum tests of Index Numbers – Time reversal test – Factor Reversal Test

Cost of living index Number – Family budget method – Aggregate expenditure method

Note:

Total	:	100 marks
* University Examination (Written practical)	:	60 "
Continuous Internal Assessment (Including Practical Record)	:	40 "

* 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

MODEL QUESTION PAPER

PERIYAR UNIVERSITY, SALEM - 11

B.Sc. Degree Examination

Branch – Statistics

(For the candidates admitted from 2017 – 2018 onwards)

Core Practical -IV	**SEMESTER – VI** **MAJOR PRACTICAL - IV**	P. Code:

Time: 3 Hours **Maximum: 60 marks**

Answer any THREE questions

All questions carry EQUAL marks

1. The following are the figures of defectives in 22 lot each containing 2,000 rubber belts. Draw p-chart and comment on state of control of the process.

   425, 430, 216, 341, 225, 322, 280, 306, 337, 305, 356, 402, 216, 264, 126, 409, 193, 326, 280, 389, 451, 420.

2. For the single sampling plan N = 2000, n = 100, c = 2

   Obtain OC curve, AOQ curve and ATI curve. Also find AOQL.

3. Fit a straight line trend by the method of Least square. Calculate the trend values.

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Value	23	38	50	68	100	125	140

Also estimate the value for 2005.

4. Calculate the seasonal indices for the following data by the method of Ratio-to-moving average.

Year	**Quarter**			
1998	12	15	14	16
1999	15	18	18	20
2000	20	23	25	20
2001	22	25	27	30

5. Find Fisher's index number from the following data. Show that Fisher's Index satisfies i) TRT and ii) FRT.

Commodity	**2003**		**2005**	
	Price	**Quantity**	**Price**	**Quantity**
A	3	8	5	10
B	5	12	7	15
C	12	7	15	10
D	10	13	10	15

(For the candidates admitted from 2017 – 2018 onwards)

SUBJECT CODES

I .CORE COURSES (Theory 9 + Elective 3 + Practical 4 = 16)

i. CORE THEORY PAPERS: 9

S.NO.	TITLE	SUBJECT CODE	SEMESTER
1.	Descriptive Statistics		I
2.	Probability Theory		II
3.	Distribution Theory		III
4.	Theory of Estimation		III
5.	Sampling Techniques		IV
6.	Testing of Hypothesis		V
7.	Statistical Quality Control		V
8.	Design of Experiments		VI
9.	Applied Statistics		VI

ii. CORE ELECTIVES PAPERS: 3

S.NO.	TITLE	SUBJECT CODE	SEMESTER
1.	Stochastic Processes		V
2.	Actuarial Statistics		VI
3.	Numerical Analysis		VI

iii. CORE PRACTICAL PAPERS :4

S.NO.	TITLE	SUBJECT CODE	SEMESTER
1.	Major Practical-I (Based on core theory papers -1 & 2)		II
2.	Major Practical-II (Based on core theory papers -3 &4)		IV
3.	Major Practical-III (Based on core theory papers -5, 6 &8)		VI
4.	Major Practical-IV (Based on core theory papers – 7 & 9)		VI

II. ALLIED COURSES (Theory 4 + Practical 2 = 6)

i. ALLIED THEORY PAPERS: 4

S.NO.	TITLE	SUBJECT CODE	SEMESTER
1.	Mathematics-I		I
2.	Mathematics-II		II
3.	Linear Programming And Its Applications		III
4.	Decision Theory And Its Applications		IV

ii. ALLIED PRACTICAL: 1+1

S.NO.	TITLE	SUBJECT CODE	SEMESTER
1.	Allied I: Mathematics Practical - 1		II
2.	Allied II: Operations Research - 2 (Based On Allied II: Theory Papers 1 & 2)		IV

III. SKILL BASED ELECTIVE COURSES: 4

S.NO.	TITLE	SUBJECT CODE	SEMESTER
1.	Regression Analysis		III
2.	Statistical Forecasting		IV
3.	Non – Parametric Test		V
4.	Queuing Theory **(OR)** Statistical Practical(SPSS)		VI

VI. NON-MAJOR ELECTIVE COURSES: 2

S.NO.	TITLE	SUBJECT CODE	SEMESTER
1.	Matrix Algebra		III
2.	Numerical Methods		IV

V. VALUE EDUCATION: 1 **I -** SEMESTER

VI. ENVIRONMENTAL STUDIES: 1 **II-** SEMESTER

VII. EXTENSION ACTIVITIES: 1 **VI –** SEMESTER

ALLIED STATISTICS

FOR B.Sc., (MATHS)/ B.Sc., (MATHS) C.A. **P. Code:**

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER I or III: Allied I or II

Paper I: Mathematical Statistics

UNIT - I::

Random Variable – Discrete and Continuous – Distribution Functions – Marginal and Conditional Distributions (Simple Problems).

Unit – II:

Mathematical Expectation – Moment Generating Function and Characteristic Function (Concept only) – Tchebychev's Inequality (Simple problems).

Discrete Distributions: Binomial, Poisson Distributions – Derivations, Properties and Applications – Simple Problems.

Unit – III:

Continuous Distribution - Normal Distribution - Derivations, Properties and Applications – Simple Problems.

Exact Sampling Distributions- t, F and χ^2 distribution (Concepts only).

Unit – IV:

Correlation and Regression: Karl – Pearson Correlation Coefficient and Spearman Rank Correlation Coefficient – Regression lines and Regression Coefficients – Properties.

Unit – V:

Curve fitting – Method of Least Squares – Fitting of First Degree and Second Degree Polynomials, Fitting of Power Curve and Exponential Curve – Simple Problems.

Reference Books:

1. Gupta. S. C. And Kapoor. V. K (2004) – Fundamentals of Mathematical Statistics – (11^{th} edition), Sultan Chand & Sons, New Delhi.
2. Sancheti. D. C. And Kapoor. V. K (2005), Statistics (7^{th} Edition), Sultan Chand & Sons, New Delhi.

ALLIED STATISTICS

FOR B.Sc., (MATHS) / B.Sc., (MATHS) C.A.

P. Code:

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER II or IV: Allied I or II

Paper II: Inferential Statistics

Unit – I:

Population and Sample; Parameter and Statistic – Point and Interval Estimation – Consistency, Unbiasedness, Efficiency (Cramer – Rao Inequality) and Sufficiency (Rao – Blackwell Theorem)

Unit – II:

Method of Estimation – Maximum Likelihood and Methods of Moments – properties of these estimators – Interval Estimation (Concept only)

Unit – III:

Testing of Hypothesis – Concept of Statistical Hypothesis – Simple and Composite hypothesis – Null and alternative Hypothesis – Critical Region – Type I and Type II Errors – Power of a Test – Neyman-Pearson Lemma.

Unit – IV:

Test of Significance – Sampling distribution – Standard Error – Large Sample Tests with regard to Mean, Difference of Means, Proportions and Difference of Proportions – Simple Problems.

Unit – V:

Test of Significance – Exact sample test based on t and F distributions with regard to Means, Variance and Correlation Coefficient – Chi-square tests for single Variance, Goodness of fit and Independence of attributes.

Reference Books:

1. Gupta. S. C. And Kapoor. V. K (2004) – Fundamentals of Mathematical Statistics – (11^{th} edition), Sultan Chand & Sons, New Delhi.

2. Sancheti. D. C. And Kapoor. V. K, Statistics (7^{th} Edition), Sultan Chand & Sons, New Delhi.

ALLIED STATISTICS PRACTICAL

P. Code:

FOR B.Sc., (MATHS) / B.Sc., (MATHS) C.A.

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER I & II or III & IV

(Based on Allied Statistics Theory Paper I & II)

Unit – I:

Computation of Measures of Location and Dispersion (absolute and relative) Co-efficient of Skewness.

Unit – II:

Fitting of Binomial, Poisson and Normal Distribution – Testing the Goodness of fit.

Unit – III:

Curve fitting – Fitting of a Straight Line ($Y=a+bx$), Second Degree Parabola $Y=a+bx+cx^2$, $Y=ae^{bx}$, $y=ab^x$ and $y=ax^b$

Unit – IV:

Computation of Correlation Co-efficient – Rank Correlation Coefficient – Regression Lines.

Unit – V:

Asymptotic and exact tests with regard to Mean, Variance, difference between means and Paired‘t’ Test – Tests for Independence of attributes.

Note:

Total: 100 marks

*University Examination (Written practical) : 60 Marks

*Continuous Internal Assessment (Including Practical Record) : 40 Marks

- 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

ALLIED STATISTICS
FOR B. Sc (Computer Science)

P. Code:

(Common to B.Sc (Information Science) and B.C.A)
(For the candidates admitted from 2017 – 2018 onwards)
SEMESTER I or III: Allied Statistics

Paper - I: Statistical methods

Unit – I:

Nature and scope of statistical methods – Limitations – types of data – Classification and Tabulation of data – Diagrammatic and Graphical representation of data.

Unit – II:

Formation of frequency distribution – Measures of Central Tendency – Mean, Median, and Mode – Merits and demerits.

Unit – III:

Measures of dispersion – Range, Quartile Deviation, Mean Deviation, Standard deviation – Co-efficient of variation.

Unit – IV:

Correlation – Scatter diagram – Karl Pearson's Co-efficient of Correlation – Spearman's rank correlation – Regression equations of two variables – Simple Problems.

Unit – V:

Sampling – Merits and Demerits of Sampling – Simple, Stratified and systematic sampling methods (Concept only) – Concept of Sampling and non-Sampling errors.

Reference Books:

1. Gupta. S. P. (2001), Statistical methods, Sultan Chand & Sons, New Delhi.
2. Pillai. R. S. N. And Bagavathi. V. (2005), Statistics, S. Chand & Company Ltd., New Delhi.

ALLIED STATISTICS
FOR B. Sc (Computer Science)

P. Code:

(Common to B.Sc (Information Science) and B.C.A)
(For the candidates admitted from 2017 – 2018 onwards)
SEMESTER II or IV: Allied Statistics

Paper - II: Applied Statistics

Unit – I:

Random Variable – Discrete and Continuous – Distribution Functions and density function – Mathematical Expectation and its properties.

Unit – II:

Binomial, Poisson distributions – Mean and Variance – Recurrence – Formula – Simple problems – Fitting of Binomial and Poisson Distributions.

Unit – III:

Normal distribution (Definition, Simple problems only) – Curve fitting – Method of least squares – fitting of Straight line and parabola – Simple problems.

Unit – IV:

Sampling distribution and Standard error (Concept only) – Test of Significance: Large sample tests for mean, difference of Means, Proportion and difference of Proportions – Simple problems.

Unit – V:

Chi – Square test – Assumptions, Characteristics and its applications – Chi-Square tests for goodness of fit and independence of attributes – Simple problems.

Reference Books:

1. Gupta. S. P. (2001), Statistical methods, Sultan Chand & Sons, New Delhi.
2. Pillai. R. S. N. And Bagavathi. V. (2005), Statistics, S. Chand & Company Ltd., New Delhi.

ALLIED STATISTICS PRACTICAL
FOR B. Sc (Computer Science)

P. Code:

(Common to B.Sc (Information Science) and B.C.A)
(For the candidates admitted from 2017 – 2018 onwards)
SEMESTER I & II or III & IV
(Based on Allied Statistics Theory Paper I & II)

Unit – I:

Construction of uni - variate frequency distribution – Diagrammatic and Graphical representation of Statistical data.

Unit – II:

Computation of measures of Central Tendency – Calculation of measures of Dispersion – Coefficient of variation.

Unit – III:

Fitting of $Y=a+bX$, $Y=a+bX+cX^2$ by the methods of least squares.

Unit – IV:

Fitting of Binomial, Poisson distribution – Test for goodness of fit using Chi-Square test.

Unit – V:

Computation of correlation co-efficient and Rank correlation – Regression equation (2 Variables Only)

Note:
Total: 100 marks

*University Examination (Written practical)	: 60 Marks
*Continuous Internal Assessment (Including Practical Record)	: 40 Marks

- 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

ALLIED STATISTICS
FOR B. Sc (GEOGRAPHY)

P. Code:

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER I or III: Allied Statistics

Paper - I: Statistical Methods

UNIT – I:

Nature and scope of Statistical methods – Limitations – types of data – Classification and Tabulation of data – Diagrammatic and Graphic representation of data

UNIT – II:

Formation of frequency distribution – Measures of central Tendency – Mean, Median, and Mode – Merits and demerits.

UNIT – III:

Measures of dispersion – Range, Quartile Deviation, Mean Deviation, Standard deviation – Co-efficient of variation

UNIT – IV:

Correlation – Scatter diagram – Karl Pearson's Co-efficient of Correlation – Spearman's rank correlation – Regression equations of two variables – Simple Problems.

UNIT – V:

Sampling – Merits and Demerits of Sampling – Simple, Stratified and Systematic sampling methods (Concept Only) – Concept of Sampling and non – Sampling errors

Reference Books:

1) Gupta.S.P.(2001), Statistical methods, Sultan Chand & Sons, New Delhi.

2) Pillai.R.S.N. And Bagavathi.V. (2005), Statistics, S.Chand & Company Ltd., New Delhi.

ALLIED STATISTICS
FOR B. Sc (GEOGRAPHY)

P. Code:

(For the candidates admitted from 2017 – 2018 onwards)
SEMESTER II or IV: Allied Statistics
PAPER II: Applied Statistics

UNIT – I:

Probability; Definition – Addition and Multiplication theorems – Conditional Probability – (Simple Problem only)

UNIT – II:

Sampling distribution and Standard error (Concept Only) – Test of Significance: Large sample tests for mean, difference of Means, Proportion and difference of Proportions – Simple problems.

UNIT – III:

Chi – Square test – Assumptions, Characteristics and applications – Chi – Square tests for goodness of fit and independence of attributes – Simple problems. Fitting of Straight line and parabola – Simple problems

UNIT – IV:

Analysis of variance (ANOVA) – concepts and examples – explanation.

ANOVA for one way and two way classifications – Procedures and simple problems.

Unit-V:

Analysis of Time Series – Definition – Components and uses of Time Series, Measures of Secular trend, Measure of Seasonal Variation - Method of simple average only

Reference Books:

1) Gupta.S.P. (2001), Statistical methods, Sultan Chand & Sons, New Delhi.

2) Pillai.R.S.N. and Bagavathi.V. (2005), Statistics, S.Chand & Company Ltd., New Delhi.

3) Gupta.S.C.Kapoor.V.K. (2007), Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.

ALLIED STATISTICS PRACTICAL FOR B. Sc (GEOGRAPHY)

P. Code:

(For the candidates admitted from 2017 – 2018 onwards)
SEMESTER I & II or III & IV
(Based on Allied Statistics Theory Paper I & II)

Unit – I:

Construction of uni - variate frequency distribution – Diagrammatic and Graphical representation of Statistical data.

Unit – II:

Computation of measures of Central Tendency – Calculation of measures of Dispersion – Coefficient of variation.

Unit – III:

Fitting of $Y=a+bX$, $Y=a+bX+cX^2$ by the methods of least squares.

Unit – IV:

Fitting of Binomial, Poisson distribution – Tests for goodness of fit using Chi-Square test.

Unit – V:

Computation of correlation co-efficient and Rank correlation – Regression equation (2 Variables Only)

Note:
Total: 100 marks

*University Examination (Written practical) : 60 Marks
*Continuous Internal Assessment (Including Practical Record) : 40 Marks

- 5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

ALLIED STATISTICS
FOR B. Sc (MICROBIOLOGY)

P. Code:

(Common to B.Sc (Bio – Chemistry) and B.Sc (Bio – technology))
(For the candidates admitted from 2017 – 2018 onwards)
SEMESTER III: Allied Statistics

Paper - I: Bio - Statistics

Unit – I:

Biostatistics – definition – types of data – Primary and Secondary data – Methods of Collection of data – Sources of data in life science – Limitation and uses of statistics.

Unit – II:

Classification and Tabulation of data – Diagrammatic and Graphic representation of data.

Unit – III:

Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean – Merits and Demerits.

Measures of dispersion: Range, Standard deviation, Mean deviation, Quartile deviation, – Merits and Demerits, Coefficient of variations.

Unit – IV:

Correlation: Types and Methods of Correlation , Rank – Correlation. Regression : Simple regression equation – fitting of regression equation.

Unit – V:

Sampling distribution - Standard error – Test of Hypothesis: Simple Hypothesis , Null hypothesis – Test of Significance: Large sample tests with regard to Mean, Differences of Means, Proportions and difference of Proportions - Small Sample Test with regard to Mean, Difference of Means and Variances – Chi – square test.

Reference Books :

1. P.S.S. Sundar Rao, J.Richard (2012). An introduction to Biostatistics and Research methodology. Fifth Edition, Prentice Hall of India Learnin Pvt Ltd, New Delhi. Price Rs.275/-
2. Gurumani. N (2005). An introduction to Biostatistics. 2nd Revised Edition, MJP Publishers, Chennai. Price Rs.160/-
3. Daniel WW,(1987). Biostatistics, John Wiley and Sons, New York.
4. Dr. Pranab Kumar Banarjee. An Introduction to Biostatistics (2011), S.Chand and Company Ltd, Ram Nagar, New Delhi. Price Rs.175/-
5. A. Indrayan, L. Sathyanarayana (2006). Biostatistics for Medical, Nursing and Pharmacy students. Prentice Hall of India Pvt Ltd, New Delhi.

Note :

1) This paper has to taught teacher and exam papers to be valued by only **Statistics Board.**

2) While setting the question paper, 50% theory and 50% problems to be considered.

ALLIED STATISTICS
FOR B. Com

P. Code:

(Common to B.Com (C.A), B.Com (C.S) and B.Com (Co – operation))

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER III: Allied Statistics

Paper - I: Business Statistical Methods

Unit – I :

Introduction – Types of data – Classification and Tabulation of Statistical data – Central Tendency – Measure of Central Tendency – Mean, Median, Mode, Harmonic Mean and Geometric Mean, Combined Mean.

Unit – II :

Dispersion: Measures of Dispersion – Range – Quartile deviation – Mean Deviation – Standard Deviation and their co- efficient. Skewness: Measure of Skewness – Karl Pearson and Bowley's Coefficient of skewness.

Unit – III :

Correlation – Types of Correlation – Measures of Correlation – Karl Pearson's Co – efficient of Correlation – Spearman Rank Correlation Co – efficient.

Simple regression analysis – Fitting of Regression lines.

Unit – IV :

Index Number – Definition and Uses of Index Numbers , Construction of Index numbers – Simple & Weighted Index numbers – test for an Ideal index Number – Chain and Fixed base index – Cost of living index numbers.

Unit – V :

Analysis of Time Series – Definition – Components and Uses of Time Series. Measures of Secular trend, Measure of Seasonal Variation – Method of Simple average only.

Text Books:

1. Business Mathematics and Statistics – P.A. Navanithan (2007) Jai Publishers, Trichy – 21.

Reference Books :

1. Statistical Methods – S.P.Gupta
2. Statistics – D.C.Sanchati and V.K.Kapoor.
3.Elements of Statistics – Donald R.Byrkt.
4. Statistical Theory and Practice – Pillai. R.S.N Bagavathi. V (2001) S. Chand & Company Ltd. 2009

Note :

1) Problems : 80% & Theory : 20%
2) This paper has to be taught by a **statistics teacher**. This paper has to be referred to **Statistics board for valuation**.

ALLIED STATISTICS
FOR B. Com

P. Code:

(Common to B.Com (C.A), B.Com (C.S) and B.Com (Co – operation))

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER IV: Allied Statistics

Paper - II: Business Statistical Decision Techniques

Unit – I:

Matrix: Definitions – Operations on Matrix – Determinant of Matrix. Inverse of a Matrix (Ad - joint Method only)

Application: Solving of Linear equations – Matrix inverse Method; Cramer's Rule.

Unit – II:

Sequence and Series – Arithmetic Progression and Geometric Progression Interpolation: Binomial Expansion Method; Newton's Forward and Backward Method, Lagrange's Method.

Unit – III:

Probability: Definition – Addition and Multiplication theorems – Conditional Probability – (Simple Problem Only)

Unit – IV:

Linear Programming – Formation of LPP. Solution to LPP – Graphical method, Simplex method, Big – M- Method

Unit – V:

Transportation Problem – North West Corner method – least cost method – Vogel's Approximation method – Assignment Problem – Balanced Hungarian Assignment method.

Text Book :

1. Business Mathematics and Statistics – P.A. Navanithan (2007) Jai Publishers, Trichy – 21.

Reference Books :

1. Dr.S.P. Gupta ; Dr.P.A.Gupta; Dr.Manmohan – Business Statistics and Operation Research
2.M.R.Vittal – Business Mathematics.

Note :

1) Problems : 80% & Theory : 20%
2) This paper has to be taught by a **statistics teacher**. This paper has to be referred to **Statistics board for valuation**.

ALLIED STATISTICS FOR B.A (ECONOMICS)

P. Code:

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER III: Allied Statistics

Paper - I: Statistical Methods for Economics

Unit – I:

Nature and scope of statistical methods and their Limitations – types of data – Primary data and Secondary data – Methods of Collection of Data - Classification and Tabulation of data.

Unit – II:

Diagrammatic representation – Simple, Multiple and Component - Percentage bar diagrams – Pie diagrams.

Unit – III:

Formation of frequency distribution – Graphical Representation – Histogram – Frequency polygon and frequency curve – O' gives curve – Lorenz Curve.

Unit – IV:

Measures of Central Tendency –Arithmetic Mean, Median, and Mode – Harmonic Mean – Geometric Mean, Weighted arithmetic mean and their uses in Economics.

Unit – V:

Dispersion – Absolute and relative – Measures of Dispersion – Range – Quartile Deviation – Mean Deviation and Standard Deviation.

Reference Books:

1. Gupta. S. P. (2001), Statistical methods, Sultan Chand & Sons, New Delhi.
2. V.K, Kapoor and Gupta (1978) Applied Statistics. S.Chand, Chennai.
3. A.L. Nayar and Das – Statistics
4. M.R.Vittal - Statistics

Note :

1) Problems : 80% & Theory : 20%
2) This paper has to be taught by a statistics teacher. This paper has to be referred to Statistics board for valuation.

ALLIED STATISTICS
FOR B.A (ECONOMICS)

P. Code:

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER IV: Allied Statistics

Paper - II: Applied Statistics for Economics

Unit – I:

Correlation – Definition – Types of Correlation – Measures of Correlation – Scatter Diagram – Simple Correlation Coefficient - Karl Pearson Correlation Co – efficient - Rank Correlation Co - efficient and their interpretation.

Unit – II:

Regression – Regression Lines – Types of Regression lines – Fitting of Regression lines – Uses in Economics

Unit – III:

Time Series analysis – Definition – uses – Components of Time series – Measures of trend – Graphic method – Semi – average method – Moving average method – Least Square method – Measure of Seasonal Variation – Simple average method.

Unit – IV:

Index numbers – Definition – Uses of index numbers – Types of Index numbers – Methods of construction – Simple index number and weighted index numbers – test for an Ideal index number – Consumer index number.

Unit – V:

Basic sampling methods – Simple random sampling – Systematic Sampling, Stratified random sampling, Quota Sampling, Purposive Sampling.

Reference Books:

1. Gupta. S. P. (2001), Statistical methods, Sultan Chand & Sons, New Delhi.
2. V.K, Kapoor and Gupta (1978) Applied Statistics. S.Chand, Chennai.
3. A.L. Nayar and Das – Statistics
4. M.R.Vittal - Statistics

Note :

1) Problems : 80% & Theory : 20%
2) This paper has to be taught by a statistics teacher. This paper has to be referred to Statistics board for valuation.

ALLIED STATISTICS
FOR B.B.A

P. Code:

(For the candidates admitted from 2017 – 2018 onwards)

SEMESTER I : Allied Statistics

Paper: I Business Mathematics and Statistics - I

Unit – I:

Series: Sequence – Series – Arithmetic Progression – Geometric Progression – Harmonic Progression (Simple Problems)

Unit – II:

Matrices – Definition – types of matrices – Operations on Matrix – Determinant of Matrix. Inverse of a Matrix (Ad-joint Method only) – Application: Solving of Linear Equations - Matrix inverse Method; Cramer's rule.

Unit – III:

Descriptive Statistics: meaning and definition of statistics – scope and limitations-source and collection of data – classification and tabulation.

Unit – IV:

Diagrams and graphs – Measures of central tendency – Mean – Median – Mode – Geometric – Harmonic Mean –combined mean.

Unit – V:

Dispersion – Absolute and relative. Measures of dispersion – Range – Quartile deviation, Mean Deviation and Standard Deviation – Lorenz Curve.

Note:

1) Problems : 80% & Theory : 20%
2) This paper has to be taught by a **statistics teacher**. This paper has to be referred to **Statistics board for valuation**.

Text Books:

1. S.P.Gupta. Statistical Methods – Sultan Chand.
2. M.R.Vittal, Business Mathematics and Statistics, Margham Publications.

Reference Books:

1. Staffrod , Business Mathematics – Tata Mc Graw Hill.
2. Sundharsan , AN introduction to Business Mathematics, Sultan Chand & Company.
3. Pillai R.S..N & Mrs. Bagavathi, Statistics – Sultan Chand & Company.
4. Dr. P.R. Vittal, Business Mathematics and Statisitcs – Tata Mc Graw Hill.
5. Sharma , Business Statistics – Margham Publications.
6. Dr.S.P Gupta & Dr. M.P. Gupta, Business Statistics, Sultan & Chand Sons.
7. R.S.N. Pillai & V. Bagavathi, Statistics , S.Chand.

ALLIED STATISTICS
FOR B.B.A

(For the candidates admitted from 2017 – 2018 onwards) | **P. Code:**

SEMESTER II : Allied Statistics

Paper - II: Business Mathematics and Statistics - II

Unit – I:

Mathematics of finance: Simple and Compound interest – annuity – present value of annuity – sinking fund – percentages – discounts.

Unit – II:

Basics of Calculus – limits – rules of differentiation – maxima and minima (for single variable only) – Simple application problems in maxima and minima

Unit –III:

Simple correlation – Scatter diagram – Karl Pearson's coefficient of Correlation – Rank Correlation Coefficient – Regression Lines – fitting of Regression Lines.

UNIT - IV:

Time Series Analysis – Components of time series – Measures of trend – free hand curve – semi and moving averages – methods of least squares – measures of seasonal variation – simple average method.

Unit –V:

Index numbers – definition – Construction of index numbers – Unweighted and Weighted Index numbers – fixed and chain base index numbers – test for an Ideal index numbers – cost of living index numbers.

Note :

1) Problems : 80% & Theory : 20%
2) This paper has to be taught by a statistics teacher. This paper has to be referred to Statistics board for valuation.

Text Books :

1. Navaneetham P, Business Mathematics, Jai Publications.

Reference Books:

1. Dharmapadam, Business Mathematics, S.Viswanathan Publications.
2. Dr.S.P Gupta & Dr.M.P. Gupta, Business Statistics, Sultan & Chand Sons.
3. Sundharsan, AN introduction to Business Mathematics, Sultan Chand & Company.
4. Pillai R.S..N & Mrs.Bagavathi, Statistics – Sultan Chand & Company.
5. Dr. P.R. Vittal, Business Mathematics and Statistics – Tata Mc Graw Hill.

ALLIED STATISTICS
FOR B.B.A (C.A)

(For the candidates admitted from 2017 – 2018 onwards)

P. Code:

SEMESTER III: Allied Statistics

Paper - I: Quantitative Techniques - I

Unit – I:

Matrix Algebra – Definition – Types of Matrices – Matrix Operations – Determinants – Inverse of Matrix – Simultaneous linear Equations (3 3 order only)

Unit – II:

Mathematics of Finance – Simple Interest – Compound Interest – Annuities – Profits and Loss – Discount on bills.

Unit –III:

Statistics: Introduction – Definition – Limitations. Collection of data – Classification and Tabulation – Diagrammatic and graphical representation of data – Measures of Central Tendency – Mean – Median – Mode – Geometric Mean – Harmonic Mean

UNIT - IV:

Measures of Dispersion – Range –Quartile deviation – Mean Deviation – Standard Deviation – Co – Efficient of Variation – Time Series – Components of time series.

Unit –V:

Correlation – Meaning – Various types of correlation – Scatter diagram – Karl Pearson's coefficient of Correlation – Rank Correlation Coefficient – Regression Lines – Regression Co - efficient.

Note :

Questions in Theory & Problems carry : 30% & 70% of Marks respectively.

Text Books :

Dr. P.R. Vittal, Business Mathematics and Statistics – Margham Publications.

Reference Books:

1. Dr.S.P Gupta & Dr.M.P. Gupta, Business Statistics, Sultan & Chand Sons.
2. Pillai R.S..N & Mrs.Bagavathi, Statistics – Sultan Chand & Company.

ALLIED STATISTICS
FOR B.B.A (C.A)

(For the candidates admitted from 2017 – 2018 onwards)

P. Code:

SEMESTER IV: Allied Statistics

Paper - II: Quantitative Techniques - II

Unit – I:

Introduction to Operation Research – Meaning – Nature – Definition – Characteristics – Phases of OR – OR in Management – OR in Decision making – Limitations.

Unit – II:

Linear programming – Introduction, Definition – Formation of LPP – Graphical Method of Solution – Simplex Method (Simple Problem Only)

Unit – III:

Transportation Problem – Finding an Initial Basic feasible solutions – North – West Corner rule – Maximin/ Minimax Method – Vogel's Approximation Method – Finding the optimum Solution – MODI Method. Assignment Problems – Hungarian Method – Maximization case in A.P. – Unbalanced.

Unit – IV:

Game Theory – Introduction – Basic terminology – Solution of Pure Strategy games –Principle of Dominance – Solution of mixed Strategy problems – Limitations.

Unit – V:

Network analysis – Construction of the Network – Time and Critical Path Calculations – CPM and PERT application.

Note :

Questions in Theory & Problems carry: 30% & 70% of Marks respectively

Text Books :

V.K. Kapoor, Operations Research, Sultan chand & Sons.

Reference Books:

1. Premkumar Gupta, DS Hira, Operations Research
2. S. Kalavathy, Operation Research, Vikas Publishing House.
3. P.R. Vittal, Introduction to Operations Research, Margham Publications.
4. R. Pannerselvam, Operation Research, PHI.