# PERIYAR UNIVERSITY, SALEM BACHELOR OF SCIENCE BRANCH – STATISTICS CBCS PATTERN REGULATIONS

#### 1. **OBJECTIVES**

Statistics is a key to success in the field of science and technology. Today, the students need a thorough knowledge of fundamental basic principles, methods, 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 with the description 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 hope with the latest development sand compete with 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 semesters, the second academic year the third and fourth semesters and the third academic year the fifth and sixth semesters.
- b) The odd semesters will consists of the period from June to November of each year and the even semesters from December to April 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.

			Sem-I			Sem-II	[	5	Sem-II	I	5	Sem-IV	V		Sem-V	7	5	Sem-V	I		Total	
Part	Course	No.of courses	Hrs/week	Credit	No.of courses	Hrs/week	Credit	No.of courses	Hrs/week	Credit	No.of courses	Hrs/ week	Credit	No.of courses	Hrs/week	Credit	No.of courses	Hrs/week	Credit	No.of courses	Hrs/week	Credit
Ι	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
	Core Theory	1	5	5	1	5	5	2	8	10	1	4	5	2	10	10	3	15	15	10	47	50
	Core Practical	-	3	-	1	3	3	-	2	-	1	2	2	-	4	-	2	6	6	4	20	11
III	Elective	-	-	-	-	-	-	-	-	-	-	-	-	2	10	10	1	5	5	3	15	15
	Allied Theory	1	9	3	2	9	6	1	4	4	1	4	4	-	-	-	-	-	-	5	26	17
	Allied practical	-	-	-	-	-	-	-	2	-	1	2	2	-	-	-	-	-	-	1	4	2
	Env. study	-	1	-	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2
IV	Value education	-	-	-	-	-	-	-	-	-	1	2	2	-	-	-	-	-	-	1	2	2
	SBEC	-	-	-	-	-	-	-	-	-	1	2	2	3	6	6	2	4	4	6	12	12
	NMEC	-	-	-	-	-	-	1	2	2	1	2	2	-	-	-	-	-	-	2	4	4
v	Extension activities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1
	Total	4	30	14	7	30	22	6	30	22	9	30	25	7	30	26	9	30	31	42	180	140

### 5. **EXAMINATIONS**

The theory examination shall be 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:

		(For the studen	ts admitted from	<u>n the year 2</u>	<u>008 onw</u>	ards)		
Sem.	Dent	C	T:41.	TT	C J:4		Mark	KS
sem.	Part	Course	1 itie	Hrs/week	Creat	CIA	UE	Total
	Ι	Tamil	Tamil I	6	3	25	75	100
I	II	English	English I	6	3	25	75	100
	ш	Core paper I	Descriptive Statistics	5	5	25	75	100
	111	First Allied Paper I	MathematicsI	6	3	25	75	100
	Ι	Tamil Tamil II		6	3	25	75	100
	II	English	English II	6	3	25	75	100
		Core Paper II	Probability theory	5	5	25	75	100
11	III	Core Paper III	Major Practical I	6 (3+3)	3	40	60	100
11		First Allied Paper II	Mathematics II	6 (3+3)	3	25	75	100
		First Allied Paper III	Mathematics III	6	3	25	75	100
	IV	Environmental	studies	2 (1+1)	2	25	75	100
	Ι	Tamil	Tamil III	6	3	25	75	100
	II	English	English III	6	3	25	75	100
		Core paper IV	Sampling techniques	4	5	25	75	100
ш	ш	Core Paper V	Distribution theory	4	5	25	75	100
		Second Allied paper I	Linear Programming and its applications	4	4	25	75	100
	IV	NMEC-I	Financial statistics	2	2	25	75	100

# **B.Sc STATISTICS** Choice Based Credit System (For the students admitted from the year 2008 onwards)

	Ι	Tamil	Tamil IV	6	3	25	75	100
	II	English	English IV	6	3	25	75	100
		Core paper VI	Theory of	4	5	25	75	100
		Core puper vi	Estimation		5	25	15	100
		Core	Major	4	2	40	60	100
		Paper VII	Practical II	(2+2)		-10	00	100
IV	III	Second Allied Paper II	Decision Theory and its Applications Allied	4	4	25	75	100
		Second Allied	practical :	4				
		Paper III	Operation	(2+2)	2	40	60	100
		1	Research					
		NMEC-II	Engineering	2	2	25	75	100
			Statistics	2	-	20	10	100
	IV	SBEC-I	Queuing	2	2	25	75	100
			Theory					
		Value Education	2	2	25	75	100	
		Core	Testing of	5	5	25	75	100
		Paper VIII	Hypothesis					
		Core	Design of	5	5	25	75	100
	III	paper IX	Experiments					
		Core paper X	Stochastic	5	5	25	75	100
		(Elective I)	Processes					
		Core paper XI	Actuarial	5	5	25	75	100
V		(Elective II)	Statistics					
		SBEC-II	Regression	2	2	25	75	100
			Analysis					
	13.7	SBEC-III	Genetical	2	2	25	75	100
	IV		Statistics					
		SDEC IV	Non-	2		25	75	100
		SBEC-IV	Parametric	2	2	25	/5	100
			Test					

		Core Paper XII	Statistical Quality	5	5	25	75	100
			Control					
		Core	Demography	5	5	25	75	100
		paper XIII						
		Core	Applied	5	5	25	75	100
	Ш	paper XIV	Statistics	6	U		10	100
		Core	Numerical					
VI		paper XV	Analysis	5	5	25	75	100
		(Elective III)	Allarysis					
		Core	Major	5	2	40	60	100
		Paper XVI	Practical III	(2+3)	3	40	00	100
		Core	Major	5	3	40	60	100
		Paper XVII	Practical IV	(2+3)	5	70	00	100
		SBEC-V	Statistical	2	2	25	75	100
	IV	SDLC V	Forecasting	2	2	20	15	100
		SBEC-VI	Econometrics	2	2	25	75	100
	V	Extension		_	1	_	_	_
	v	Activities		-	1	-	-	-
		Total		180	140	-	-	-

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

# 7. QUESTION PAPER PATTERN FOR ALL CORE, ALLIED & ELECTIVE COURSES

#### 7.1. Question Paper Pattern for Core Paper (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)

#### **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

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#### 7.2 Question Paper Pattern for Core & Allied Practical

# **Time : Three hours**

Maximum : 60 marks

**Answer Any THREE questions** 

#### out of FIVE questions

#### (One question from each unit)

#### **Distribution of Marks for Core and Allied Practical:**

University Examination (Written Practical)	-	60 marks
Continuous Internal Assessment (CIA) (Including Practical Record)	-	40 marks

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	Maxi	mum	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.

# 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 2008-2009 ie, for the students who are admitted to the first year of the course during the academic year 2008-2009 and thereafter.

#### **12. TRANSITARY PROVISION**

Candidates who were admitted to the UG course of study prior to 2008-2009 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 2013. Thereafter they will be permitted to appear for the examination only under the regulations then in force.

# LIST OF COURSES

CORE COURSES : (Theory 10 + Practical 4) : 14
 (i) CORE THEORY : 10

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

# (ii) CORE PRACTICAL: 4

- Major practical I
   (Based on Core theory papers 1 & 2)
- Major practical II
   (Based on core theory papers 3, 4 & 5)
- Major practical III
   (Based on core theory papers 6,7 & 8)
- 4. Major practical IV
  (Based on core theory papers 9 & 10)

#### II. CORE ELECTIVES: 3

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

# III. ALLIED COURSES (Theory 5 + Practical 1)

# (i) ALLIED THEORY : 5

- 1. Mathematics I
- 2. Mathematics II
- 3. Mathematics III
- 4. Linear Programming and its Applications
- 5. Decision Theory and its Applications.

# (ii) ALLIED PRACTICAL: 1

Operations Research (Based on Allied theory papers 4 & 5)

# IV. SKILLS BASED ELECTIVE COURSES : 6

- 1. Queueing Theory
- 2. Regression Analysis
- 3. Genetical Statistics
- 4. Non-Parametric Tests
- 5. Statistical Forecasting
- 6. Econometrics

# V. NON MAJOR ELECTIVE COURSES : 2

- 1. Financial Statistics
- 2. Engineering Statistics

# VI.ENVIRONMENTAL STUDIES : 1

# VII.VALUE EDUCATION :1

# VIII.EXTENSION ACTIVITIES : 1

• Training Report

# PERIYAR UNIVERSITY, SALEM

# **B.Sc., STATISTICS**

# **CBCS PATTERN**

# SYLLABUS AND MODEL QUESTION

# (for candidates admitted from 2008-09 onwards)

Part	Course title	No.of	Hours /	Credit	Marks				
I al t	Course the	courses	week	Cituit	CIA	UE	Total		
Ι	Tamil I	1	6	3	25	75	100		
II	English I	1	6	3	25	75	100		
	Core paper I :								
III	Descriptive	1	5	5	25	75	100		
	Statistics								
	Core Paper III :		3						
	Major Practical I	-	5	-	-	-	-		
111	First Allied Paper I	1	6	3	25	75	100		
	: Mathematics I	1	0	5	23	15	100		
	First Allied								
	Paper II:	-	3	-	-	-	-		
	Mathematics II								
IV	Environmental		1						
IV	Studies	-	1	-	-	-	-		
	Total	4	30	14	-	-	-		

### **SEMESTER – I**

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – I CORE PAPER –I DESCRIPTIVE STATISTICS

# UNIT – I

Collection and sources of statistical data – Formation of frequency distribution – discrete and continuous – Exclusive and Inclusive – cumulative frequency distribution (ogives) – Representation of data – 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 – 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 – Types of Kurtosis.

#### $\mathbf{UNIT} - \mathbf{V}$

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

# **Reference Books:**

- Gupta, S.C, and Kapoor, V.K. (2004). Fundamental of Mathematical Statistics (11<sup>th</sup> –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.

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – I FIRST ALLIED PAPER –I ALLIED MATHEMATICS – I

#### **UNIT I: Rank of a matrix**

Definition – Rank of a matrix – Problems – Condition for consistency – Solution to a system of non-homogeneous equation – Orthogonal and Unitary matrices – Problems.

#### **UNIT II : Differential Calculus**

Jacobians = condition for maxima and minima of functions of two variables – Problems – Lagrange's multiplier – Simple problems.

#### **UNIT III : Integration**

Integration by parts – Bernoulli's formula – Definite integral – Simple properties and problems – Double integral – Simple problems.

#### **UNIT V : Sequences of real numbers**

Definition of sequence and subsequence – Limit of a sequence – Convergent sequences – Divergent sequence – Bounded sequences – Monotone sequences – Operations on Convergent Sequences – Operations on divergent sequences – Limit superior and limit inferior – Cauchy sequences.

#### **UNIT V : Series of real numbers**

Convergence and divergence – Series with non-negative terms – Alternating series – Conditional convergence and absolute convergence – Rearrangements of series - Tests for absolute convergence – simple problems.

#### **Reference Books**

- Dr.P.R.;Vittal; Allied Mathematics, Margham Pub, Chennai 17. (For Units I, II and III).
- 2. Richard R. Goldberg; Methods of Real Analysis, (For unit IV Sec 2.1 to 2.10).
- 3. S.C.Malik; Mathematics Analysis, (For Unit V, Sec 3.1 to 3.6).

# **MODEL QUESTION PAPER**

# PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

#### **Branch – Statistics**

# SEMESTER - I

#### CORE 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 $(5 \times 5 = 25)$

#### **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  $\mu_2$  and  $\mu_3$ .

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

#### $Part - C (3 \times 10 = 30)$

#### **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 upto 4<sup>th</sup> order.

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

# **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch** – Statistics

#### SEMESTER - I

#### FIRST ALLIED PAPER – 1

#### **ALLIED MATHEMATICS - I**

Time : 3 Hours

Maximum: 75 Marks

Part - A 
$$(10 \times 2 = 20)$$

#### **Answer ALL questions**

1. Define orthogonal matrix and unitary matrix.

2. Find the rank of  $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ -1 & -2 & -3 & -4 \end{pmatrix}$ 3. If x = r cos  $\theta$ , y = r sin  $\theta$  find  $\frac{\partial(x, y)}{\partial(r, \theta)}$ 

4. Write the necessary and sufficient conditions for a function f(x,y) to attain maximum

and minimum

5. Evaluate  $\int \log x \, dx$ 

6. Evaluate 
$$\int_{0}^{\pi/2} \frac{Sin^4 x}{Sin^4 x + Cos^4 x} dx$$

- 7. Define Cauchy sequence
- 8. Find the limit of  $\left\{\frac{2n}{n+4n^{1/2}}\right\}_{n=1}^{\infty}$
- 9. Define conditional convergence and absolute convergence
- 10. State D' Aleberts ratio test.

# Part - B (5 x 5 = 25)

# **Answer ALL questions**

11. (a) Test the consitency for 
$$x-2y + 3z = 2$$
;  $2x - 3z = 3$ ;  $x + y + z = 0$ .

(or)

(b) Find the rank of 
$$\begin{pmatrix} 2 & 3 & -1 & 1 \\ 1 & -2 & 3 & 4 \\ 5 & 4 & 1 & 6 \end{pmatrix}$$

12. (a) If 
$$x + y + z = u$$
;  $y + z = uv$ ;

z = uvw, prove that 
$$\frac{\partial(x, y, z)}{\partial(u, v, w)} = u^2 v$$

(or)

(b) Find the maximum or minimum values of the function

f (x,y) = 
$$x^2 + y^2 - 3xy + 2x$$
  
13. (a) Evaluate  $\int_{0}^{1} \int_{1}^{2} (x^2 + y^2) dx dy$ 

(or)

(b) Evaluate 
$$\int_{0}^{\pi/4} \log(1 - \tan \theta) d\theta$$

14. (a) If  $\{S_n\}_{n=1}^{\alpha}$  is a Cauchy sequence of real numbers, then  $\{S_n\}_{n=1}^{\alpha}$  is convergent

(or)

(b) Let  $\{S_n\}_{n=1}^{\alpha}$  and  $\{t_n\}_{n=1}^{\alpha}$  be sequences of real numbers. If  $\lim_{n \to \alpha} s_n = L$  and if

$$\lim_{n \to \alpha} t_n = M \text{, then prove that } \lim_{n \to \alpha} (s_n + t_n) = L + M.$$
15. (a) If  $\sum_{n=1}^{\infty} a_n$  converges absolutely then prove that  $\sum_{n=1}^{\infty} a_n$  converges.
(or)

(b) If 
$$\sum_{n=1}^{\infty} a_n \ll \sum_{n=1}^{\infty} b_n and \sum_{n=1}^{\infty} |b_n| \ll \infty$$
 then prove that  $\sum_{n=1}^{\infty} |a_n| \ll \infty$ .

# $Part - C (3 \times 10 = 30)$

#### Answer any THREE questions

16. Solve using matrices if consistent

x - y + z = 2; 2x + y + 2z = 4; x - 2y - z = 0.

17. Show that the maximum values of  $x^2y^2z^2$  subject to the condition  $x^2y^2z^2 = a^2$  is

$$\left(\frac{a^2}{3}\right)^3.$$

- 18. (i) Prove that  $\int_{0}^{\pi/2} \log \sin x \, dx$ 
  - (ii) Evaluate  $\iint xy \, dx \, dy$  over the region in the positive quadrant for which

$$x + y \le 1$$
.

- 19. Prove that  $\left\{ \left(1 + \frac{1}{n}\right)^n \right\}_{n=1}^{\infty}$  is convergent.
- 20. State and prove Cauchy's root test

# PERIYAR UNIVERSITY, SALEM

# **B.Sc., STATISTICS**

# **CBCS PATTERN**

# SYLLABUS AND MODEL QUESTIONS

# (for candidates admitted from 2008-09 onwards)

# **SEMESTER – II**

Part	Course title	No.of	Hours /	Credit	Ν	Marks	
1 urt		courses	week	create	CIA	UE	Total
Ι	Tamil II	1	6	3	25	75	100
II	English II	1	6	3	25	75	100
	Core paper II : Probability Theory	1	5	5	25	75	100
III	Core Paper III : Major Practical I	1	3	3	40	60	100
	First allied paper II: Mathematics II	1	3	3	25	75	100
	First Allied Paper III: Mathematics III	1	6	3	25	75	100
IV	Environmental Studies	1	1	2	25	75	100
	Total	7	30	22	-	-	-

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – II CORE PAPER – II PROBABILITY THEORY

# 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, Theorems on Probability – Addition theorem, total theorem on probability – Conditional probability – Multiplication theorem – Baye's theorem.

#### 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 events and random variable - Pairwise independence and mutual independence.

#### UNIT – III

Mathematical expectation of a 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 (2004). Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publications, New Delhi.
- J.N.KAPUR and H.C.SAXENA (1989). Mathematical Statistics S.Chand and Company Ltd., New Delhi.
- MAREK. FISZ, (1961). Probability Theory and Mathematical Statistics, John Wiley and Sons.

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – II CORE PAPER – III MAJOR PRACTICAL – I

# 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.

#### $\mathbf{UNIT} - \mathbf{IV}$

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

# UNIT – V

Calculation of characteristic roots of a matrix of order three – Computation of matrix inverse using Cayley – Hamilton theorem.

#### 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 CBCS PATTERN (2008-2009) SEMESTER – II FIRST ALLIED PAPER –II ALLIED MATHEMATICS – II

#### **UNIT – I: Matrix Theory**

Characteristic equation – eigen values – eigen vectors – simple properties – Cayley Hamilton theorem – verification of the theorem – finding the inverse of matrix by using Cayley Hamilton theorem.

#### **UNIT – II : Laplace Transform**

Definition – Linear property – Shifting property – change of scale property – Laplace Transform of derivatives – Laplace Transform of integral – Problems.

#### **UNIT – III : Inverse Laplace Transform**

Solving problems by using the properties of inverse – Laplace Transform – findings the solution of differential equation's (second order) problems by using this Transform.

#### **UNIT-IV : Fourier series**

Definition – Fourier coefficients – Periodic functions with period  $2\pi$ .

#### UNIT – V : Limits and continuity

Limit of a function on the real line – Limit of a function of addition, subtraction, multiplication – Right hand and left hand limit – continuity of a function – Simple problems to verify continuity.

#### **Reference Books**

- Dr.P.R.;Vittal; Allied Mathematics, Margham Pub, Chennai 17. (For Units I, II and III and IV).
- 2. Richard R. Goldberg; Methods of Real Analysis, (For unit V).
- 3. S.C.Malik; Mathematical Analysis, (For Unit V).

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – II FIRST ALLIED PAPER –III ALLIED MATHEMATICS – III

#### **UNIT I : Ordinary Differential Equations**

Second order differential equations with constant coefficients – Particular integrals of the type  $e^{ax}$  V where V is x or  $x^2$  or cos ax or sin ax – second order differential equations with variable coefficients.

#### Unit – II : Finite Differences

Definition of interpolation and extrapolation – finite differences – relation between the operators  $\Delta$  and E – Forward and Backward difference tables – Newton's forward formula – Newton's backward formula – Lagranges formula.

#### **Unit III : Beta Gamma Functions**

Definitions of Beta and Gamma functions – Properties of Beta and Gamma functions – Evaluation of multiple integrals using Beta and Gamma functions.

#### **Unit IV – Differentiability**

Derivative at a point – Right and Left hand derivative – Derivative of addition, subtraction and multiplication of functions – Derivative of a function with continuity – Simple problems.

#### **Unit V : Theorems on Differentiability**

Verification of differentiability and continuity – Rolle's theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's theorem with Lagrange's form of remainder – Verification of theorems.

# **References Books**

- 1. P.R.Vittal; Allied mathematics, (For Unit I and II).
- 2. T.K. Manickavasagam Pillai, S.Narayanan; Calculus (Vol II), (For Unit III)
- 3. J.N.Sharma & A.R.Vasistha; Real Analysis. (For Unit IV and V).
- Richard R. Goldberg; Methods of Real Analysis. Oxford & IBH Publishing Co, New Delhi.

# **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch** – Statistics

# SEMESTER - II

#### CORE PAPER – II

#### **PROBABILITY THEORY**

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 pairwise independence of events.

5.Define mathematical expectation of a random variable.

6.Define r<sup>th</sup> 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 r.v. 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 a distribution function of the random variable X.

18. State and prove Tchebychev's inequality

19.State and prove the properties of the characteristic function of the 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.

# MODEL QUESTION PAPER PERIYAR UNIVERSITY, SALEM – 11 B.Sc. Degree Examination Branch – Statistics SEMESTER - II

#### **CORE PAPER - II**

# **MAJOR PRACTICAL – I**

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

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

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

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

- 4. Given the probabilities of 3 events A, B & C occurring are P(A) = 0.35,
  P (B) = 0.45, P (C) = 0.20. Assuming that A or B or C has occurred, the probability of occurrence of another events X, P (X/A) = 0.8, P (X/B) = 0.65, P (X/C) = 0.30.
  Find P (A/X), P (B/X), P (C/X).
- 5. Using Newton's Gauss formula interpolate the value of Y when X = 13;

Y:10121416X:25324050

# **MODEL QUESTION PAPER**

### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch – Statistics** 

#### SEMESTER - I

#### FIRST ALLIED PAPER – II

### **ALLIED MATHEMATICS - II**

Time : 3 Hours

Maximum: 75 Marks

Part - A  $(10 \times 2 = 20)$ 

#### **Answer ALL questions**

1. Find the eigen values of

$$\begin{pmatrix} a & h & g \\ o & b & o \\ o & o & c \end{pmatrix}$$

- 2. State Cayley Hamitton's theorem
- 3. Defien Beta function
- 4. Prove that  $\sqrt{1/2} = \sqrt{\pi}$

5. Define Fourier series of periodic function with period  $2\pi$ .

- 6. Find the Fourier coefficient  $a_0$  for  $f(x) = \pi^2 x^2$  in  $(-\pi, \pi)$
- 7. Evaluate L ( $\cos t/2$ )
- 8. Find the Laplace transform of  $e^{-3t} \cos 2t$ .
- 9. Evaluate  $L^{-1}\left(\frac{1}{s^2-a^2}\right)$

10. Evaluate  $L^1(\overline{f}(as))$ .

Part - B 
$$(5 \times 5 = 25)$$

#### **Answer ALL questions**

11. (a) Find the eigen values of 
$$\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$
 (or)  
(b) Find the characteristics vectors of 
$$\begin{pmatrix} 3 & 2 \\ 2 & 3 \end{pmatrix}$$

13. (a) Obtain a Fourier series for  $f(x) = \frac{1}{2} (\pi - x), 0 < x < 2\pi$ 

(or)

(b) Find the fourier coefficients  $a_n$  for  $f(x) = -\pi$ ,  $0 < x < \pi = x - \pi$ ,

$$=\pi < x < 2\pi$$
.

14. (a) Evaluate  $L(\cos^4 t)$ 

- (b) Evaluate L ( $t \sin^2 t$ )
- 15. (a) Find L<sup>-1</sup> (log  $(\frac{s+1}{s-1})$ )
- (or)
- (b) Find L<sup>-1</sup>  $(\frac{1}{s(s+a)})$

# $Part - C (3 \times 10 = 30)$

#### Answer any THREE questions

- 16. Verify Cayley Hamilton theorem for  $A = \begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}$ . Hence find its inverse.
- 17. Show that  $\beta$  (m, n) =  $\frac{\sqrt{m}\sqrt{n}}{\sqrt{m+n}}$

18. Obtain the Fourier series for  $f(x) = x^2$  in the interval  $-\pi < x < \pi$  and hence show that

- (i)  $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots + \alpha = \frac{\pi^2}{6}$  (ii)  $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots + \alpha = \frac{\pi^2}{12}$
- 19. (a) Find L (t  $e^{2t} \cos 5t$ )

(b) Find L 
$$\left(\frac{e^{3t} - e^{-12t}}{t}\right)$$

20. Solve using Laplace transform  $\frac{d^2 y}{dx^2} + 4\frac{dy}{dx} + 13y = 2e^{-x}$  given y (o) = O & y' (0) = -1

#### **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch** – Statistics

#### **SEMESTER - I**

#### FIRST ALLIED PAPER – III

#### **ALLIED MATHEMATICS - III**

Time : 3 Hours

Maximum: 75 Marks

Part - A  $(10 \times 2 = 20)$ 

#### **Answer ALL questions**

1. Solve :  $(D^2 + D + 1) y = 0$ 

2. Solve  $(D^2 - 4D + 3) y = 0$ 

- 3. Define (i) Interpolation (ii) Extrapolation
- 4. Prove that  $E = 1 + \Delta$
- 5. If f(x) = x for  $0 \le x < 1$  and

$$f(x) = 3 - x$$
 for  $1 \le x \le 2$ , find  $\lim_{x \to 1} f(x)$ 

6. Define continuity of a function at a point

- 7. Using the definition of derivative, find the derivative of  $x^2$ .
- 8. If  $f(x) = x^2 \sin \frac{1}{x}$  for  $x \neq 0$ , f(0) = 0, find  $f^{t}(0)$ .
- 9. State Rolle's theorem
- 10. Find C of the mean value theorem for  $f(x) = x^2$  in [0, 1]

#### Part - B (5 x 5 = 25)

#### **Answer ALL questions**

11. (a) Solve 
$$(D^2 - 6D + 9)y = e3^x$$

(or)

(b) Solve  $(D^2 - 3D + 2) y = e^{5x} + 2$ 

- 12. (a) Find the missing term of the following

(b) Obtain the Newton's backward interpolation formula.

13. (a) If f and g are two functions defined on R<sup>1</sup> such that  $\lim_{x \to a} f(x) = l \& \lim_{x \to a} g(x) = m$ then prove that  $\lim_{x \to a} (f+g) = 1 + m$ 

#### (or)

(b) Examine the continuity of  $f(x) = \sqrt{x+3}$ , 0 < x < 2 at x = 1.

14. (a) Derive the addition theorem for derivative.

(or)

- (b) A function f is defined on R by f(x) = x if  $0 \le x < 1$ . Is f(x) show that Lf'(1) = R'f'(1)
- 15. (a) Find c of Rolles theorem for f(x) = (x-a) (b-x),  $a \le x \le b$

(or)

(b) Verify Cauchys mean value theorem for the function x<sup>2</sup> & x<sup>3</sup> in the interval [1,2].

 $Part - C (3 \times 10 = 30)$ 

#### Answer any THREE questions

16. Solve  $(1+x^2) \frac{d^2 y}{dx^2} + (1+x) \frac{dy}{dx} + y = 2 \sin [\log (1+x))]$ 

17. Find, by suitable interpolation formula, the value of f(2.5) from the following

x :2345f(x):14.516.317.518

18. (i) If  $\lim_{x\to c} f(x) = 1$  &  $\lim_{x\to c} g(x) = m$  prove that  $\lim_{x\to c} (f.g) x = lm$ 

(ii) Investigate the continuity of  $f(x) = \frac{x^3 - 8}{x^2 - 4}$  if  $x \neq 0$  at x = 2= 3 if x = 2

19. Suppose f and g have derivative of all orders at C and h = fg

Prove (i) h'(c) = f'(c) g(c) + f(c) g'(c)

(ii) h" (c) = f" (c) 
$$g(c) + 2 f'(c) g'(c) + f(c) g''(c)$$

20. State and prove

(i) Lagrange's mean value theorem

(ii) Cauchy's mean value theorem.

# PERIYAR UNIVERSITY, SALEM

# **B.Sc., STATISTICS**

# **CBCS PATTERN**

# SYLLABUS AND MODEL QUESTION

# (for candidates admitted from 2008-09 onwards)

### **SEMESTER – III**

Part	Course title	No.of	Hours /	Credit	Marks		
1 41 0		courses	week	Crean	CIA	UE	Total
Ι	Tamil III	1	6	3	25	75	100
II	English III	1	6	3	25	75	100
	Core paper IV : Sampling Techniques	1	4	5	25	75	100
III	Core Paper V : Distribution Theory	1	4	5	25	60	100
	Core paper VII : Major Practical II	-	2	-	-	-	-
	Second Allied Paper I : Linear Programming and its Applications	1	4	4	25	75	100
	Second Allied paper III: Allied Practical – Operation Research	-	2	-	-	-	-
IV	NMEC – I : Financial Statistics	1	2	2	25	75	100
	Total	6	30	22	-	-	-

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – III CORE PAPER – IV 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 Nonsampling 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 preassigned '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.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – III CORE PAPER – V DISTRIBUTION THEORY

## Unit – I

Univariate discrete distributions – their properties – uniform, binomial, poisson, geometric, hyper geometric and negative binomial distributions – Relationship between binomial, poisson and normal distributions.

### 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 of t-random variable – 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<sup>th</sup> 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.

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – III SECOND ALLIED PAPER - I LINEAR PROGRAMMING AND ITS APPLICATIONS

## 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 – Artifical 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:**

- Kanti Swarup, P.K.Gupta, Manmohn (1980) Operations Research, Sultan Chand and sons, New Delhi.
- J.K. Sharma: (1997), Operations Research and Application, Mc.Millan and Company, New Delhi.
- Dr.B.S.Goel & Dr.S.K.Mittal Operations Research Pragathi Prakasam Publishers.

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – III NON MAJOR ELECTIVE COURSES NMEC-I FINANCIAL STATSTICS

## Unit – I

Simple interest, compound interest, effective rate and nominal rate of interest, depreciation.

## Unit – II

Annuities and its types, present value and deferred annuity.

## Unit – III

Discounting of Bills, True discount, Bankers discount, Bankers gain.

#### Unit – IV

Progressions : Arithmetic and geometric progression.

## Unit – V

Input – output model : Explanation, types, Hawkins – Simon conditions.

## **Reference Books**

- 1. P.A.Navnitham; Business Mathematics and Statistics, Jai Publishers, Trichy
- 2. D.R.Agarwal; Quantitative methods, Vrinda Publications (P) Ltd, New Delhi.

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch** – Statistics

## SEMESTER - III

#### **CORE PAPER - IV**

## 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 systametic 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.

 $Part - C (3 \times 10 = 30)$ 

## 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,

$$V(\overline{y_n}) = \begin{matrix} S^2 & N-n \\ ---- & ---- \\ n & N \end{matrix}$$

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

19. Discuss the bias of the ratio estimate

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

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch** – Statistics

## SEMESTER – III

#### **CORE PAPER - V**

## **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 student's 't' distribution function

19.Drive the chi square distribution function.

20. Derive the p.d.f. o r<sup>th</sup> order statistics.

## **MODEL QUESTION PAPER**

#### **PERIYAR UNIVERSITY, SALEM – 11**

**B.Sc. Degree Examination** 

#### **Branch** – Statistics

## **SEMESTER - III**

#### **SECOND ALLIED PAPER - I**

### LINEAR PROGRAMMING AND ITS APPLICATIONS

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 the following terms: feasible solution and optimum solution of 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:

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

Subject to the constraints,

 $8 x_1 + 2 x_2 + x_3 \ge 3$   $3 x_1 + 6 2x_2 + 4x_3 \ge 4$   $4 x_1 + x_2 + 5 x_3 \ge 1$   $x_1 + 5x_2 + 2x_3 \ge 7$  $x_1, x_2, x_3 \ge 0$ 

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.

## PERIYAR UNIVERSITY, SALEM

## **B.Sc., STATISTICS**

## **CBCS PATTERN**

## SYLLABUS AND MODEL QUESTIONS

## (for candidates admitted from 2008-09 onwards)

## **SEMESTER – IV**

Part	Course title	No.of	Hours /	Credit	Marks		
1 41 1	Course the	courses	week	Crean	CIA	UE	Total
Ι	Tamil IV	1	6	3	25	75	100
II	English IV	1	6	3	25	75	100
VI	Core Paper VI : Theory of Estimation	1	4	5	25	75	100
	Core Paper VII : Major Practical II	1	2	2	40	60	100
	Second Allied Paper II: Decision Theory and its Applications	1	4	4	25	75	100
	Second Allied Paper III: Allied Practical – Operation Research	1	2	2	40	60	100
IV	NMEC – II : Engineering Statistics	1	2	2	25	75	100
	SBEC-I : Queuing theory	1	2	2	25	75	100
	Value - Education	1	2	2	25	75	100
	Total	9	30	25	-	-	-

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – IV CORE PAPER – VI THEORY OF ESTIMATION

#### Unit – I

Point Estimation – Distinction between Estimator and Estimate – Properties of Estimators – Concept of Unbiasedness, Consistency, Efficiency and Sufficiency and their inter relationship – 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 it optional 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.(974), 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.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER - IV CORE PAPER – VII MAJOR PRACTICAL – II

## 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 and variance of the population mean - Variance of the estimator of mean under proportional and optimum allocations.

## Unit – II

Systematic sampling: Estimation of mean and its variance – Ratio and Regression methods of estimation based on simple random sampling.

## Unit – III

Fitting of curves by the least square method, method of selected points (Gompertz curve, Logistic curve and exponential curve) – Multiple regression of three variables – Multiple correlation and partial correlation.

#### 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 binomal, 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.

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER - IV SECOND ALLIED PAPER - II 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 remains 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.
- J.K.Sharma, (1977): Operations Research, Theory & Application Mc.Millan India Ltd.
- 3. Dr.B.S.Goel & Dr.S.K.Mittal: Operations Research. Pragathi Prakasam Publishers.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – IV SECOND ALLIED PAPER III ALLIED PRACTICAL : OPERATIONS RESEARCH

## Unit – I

Linear programming problem – Graphical Method – Simplex Method – Big – Method (Not more than three constraints) – Duality in LPP.

## Unit – II

Transportation Problem – Basic feasible solutions – By NWC rule – Matrixminima – VAM Methods – Optimum solution by MODI Method – Unbalanced TP. Assignment Problem – Balanced – Unbalanced 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 Grame.

## Unit – IV

Decision theory - Decision making under deterministic situation, probabilistic situation – EMV – Decision tree method. Sequencing problem n jobs on two machines and n jobs on three machines.

## Unit – V

Replacement problem – Items that deteriorate gradually 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.

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER - IV NMEC-II ENGINEERING STATISTICS

## Unit – I

Concept of Reliability – Hazard rate – types.

## Unit – II

Use of exponential and weibull distribution in reliability.

## Unit – III

Reliability systems – series, parallel.

## Unit – IV

Evaluation of reliability in series and parallel systems.

## Unit – V

Life testing – meaning – its use in engineering and technology.

## **References Books:**

- 1. L.S.Srinath : Reliability Engineering. East West Press Pvt Ltd, New Delhi.
- 2. E.Balagurusamy : Reliability Engineering. Tata McGraw Hill Ltd, New Delhi.

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SKILLS BASED ELECTIVE COURSES SYLLABUS SBEC-I QUEUEING THEORY

## Unit – I

Queue - Queueing system - Kendal's terminology - States.

## Unit – II

Markovian & Non-Markovian queue – Poisson axioms

### Unit – III

Distribution of arrivals and departures under Markov model - pure Birth – Death process – transient state solution.

## Unit – IV

Explanation – steady state results of M/M/1;  $\infty$  / FIFO Model – Averages – Little's formula.

#### Unit – V

Explanation – Steady state resuls of M/M/1; N / FIFO model – Averages.

## **Reference Books:**

- Kanti Swarup, P.K.Gupta and Man Mohan (1985) : Operations Research, Sultan Chand and Sons, New Delhi.
- 2. P.K.Gupta and D.S.Hira : Operations Research. S.Chand and Co., Ltd, New Delhi.

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch** – Statistics

## SEMESTER – IV

#### **CORE PAPER - VI**

#### 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 Neymon – 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  $x_1, x_2, \dots, x_n$  be a random sample from the normal population N ( $\mu$ , 1). Show

that 
$$T = \frac{1}{n} \sum_{i=1}^{n} x_i^2$$
 is an unbiased estimate of  $1 + \mu^2$ .

(or)

b) Let x, .....x<sub>n</sub> be a random sample from a population with p.d.f. f (x:  $\theta$ )= $\theta$  x<sup> $\theta$ -1</sup>, 0 ≤ x < 1. Prove that T =  $\prod_{i=1}^{n} x_i$  is sufficient for the parameter  $\theta$ . 12.a)Prove that MVUE is unique

or

b) Obtain C-R lower bound for the Couchy 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 ( $\chi^2$ ) 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

# MODEL QUESTION PAPER PERIYAR UNIVERSITY, SALEM B.Sc. Degree Examination Branch – Statistics SEMESTER – IV CORE PAPER - VII 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 cultiaved 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:

Xi :	170	47	69	91	126	87	195	255	135
	146	154	146	110	112	153			
Yi	: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):12345678910Weight (Y):52.558.765.070.275.481.187.25.5101.2108.4

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

		4	4	4	4
Probability		(2+0)	(1 <b>-</b> θ)	(1 <b>-</b> θ)	θ
Frequency	:	299	138	185	118
Classes	:	AB	Αβ	αB	αβ

Estimate the parameter  $\theta$ , 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

## **MODEL QUESTION PAPER**

#### **PERIYAR UNIVERSITY, SALEM – 11**

**B.Sc. Degree Examination** 

**Branch** – Statistics

## **SEMESTER - IV**

#### **SECOND ALLIED PAPER - II**

#### **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 remain 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

$$\begin{array}{cccccccc} & & & & & B \\ & & & 1 & 2 & 3 & 4 \\ & & I & 20 & 15 & 12 & 35 \\ 25 & 14 & 8 & 10 \\ & & III & 40 & 2 & 10 & 5 \\ & & IV & -5 & 4 & 11 & 0 \end{array}$$

b)Solve the following 2 x 2 game

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 should the businessman choose if he adopts the Hurwich criterion with his degree of optimism being .7.

		Pay o	offs	
Alternative	А	В	С	D
Х	8	0	-10	6
Y	-4	12	18	-2
Ζ	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

14a)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:

Year12345678Running Cost20050080012001800250032004000

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

#### $Part - C (3 \times 10 = 30)$

## 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	.1	.2	.3	.2	.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.

Task	:A	В	С	D	Е	F	G	Н	Ι
Least									
time	:5	18	26	16	15	6	7	7	3
Greate	est								
time	:10	22	40	20	25	12	12	9	5
Most									
likely									
time:	8	20	33	18	20	9	10	8	4

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



## 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.

## **MODEL QUESTION PAPER**

## PERIYAR UNIVERSITY

**B.Sc. Degree Examination** 

**Branch – Statistics** 

## **SEMESTER – IV**

#### **SECOND ALLIED PAPER - III**

## **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  $4x_1 + 6x_2 + 3x_3 \le 8$   $3x_1 - 6x_2 - 4x_3 \le 1$   $2x_1 + 3x_2 - 5x_3 \ge 4$ and  $x_1, x_2, x_3 \ge 0$ 

2. Obtain the optimum solution to the following transporation problem

		То		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.

		Play	Player B				
		Ι	Π	Ш	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

## PERIYAR UNIVERSITY, SALEM

## **B.Sc., STATISTICS**

## **CBCS PATTERN**

## SYLLABUS AND MODEL QUESTIONS

## (for candidates admitted from 2008-09 onwards)

## SEMESTER-V

Dant	Course 4:410	No.of courses	Hours / week	Credit	Marks		
rari	Course title				CIA	UE	Total
III	Core Paper VIII :	1	5	5	25	75	100
	Testing of						
	Hypothesis						
	Core Paper IX :	1	5	5	25	75	100
	Design of						
	Experiments						
	Core Paper X :	1	5	5	25	75	100
	Elective I : Stochastic						
	Processes						
	Core Paper XI :	1	5	5	25	75	100
	Elective II : Actuarial						
	Statistics						
	Core Paper XVI :	-	2	-	-	-	-
	Major practical III						
	Core Paper XVII :	-	2	-	-	-	-
	Major Practical IV						
IV	SBEC - II :	1	2	2	25	75	100
	<b>Regression Analysis</b>						
	SBEC – III :	1	2	2	25	75	100
	Genetical Statistics						
	SBEC – IV : Non-	1	2	2	25	75	100
	Parametric Tests						
	Total	7	30	26	-	-	-

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – V CORE PAPER – VIII 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 – Neyman-Pearson Lemma- UMP test- Simple problems.

## Unit – II

Analysis of Variance (ANOVA) – Concept and example – Explanation – ANOVA for one way and two – classifications – Procedures and inference – Independence of attributes – m x n contingency table – chi-square test analysis.

#### Unit – III

Testing of significance – Large sample and small sample tests – Normal test for mean, variance, proportion and co-efficient of correlation – Small sample tests based on t, F and chi-square for testing mean and variance.

## Unit – IV:

Paired t-test procedures – its significance and uses – Likelihood Ratio (LR) Test – Procedure and simple applications – Properties and uses of LR test – Relationship between testing of hypothesis and confidence interval.

#### 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.

# B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – V CORE PAPER – IX DESIGN OF EXPERIMENTS

#### Unit – I

Basic principles of experimental design – Replication, Randomization and Local Control – Uniformity trials – LSD test – SNK test – Duncan's multiple range test – Tukeys (hsd) test.

## Unit – II

Need for transformation of data – square root- Angular and Logarithmic transformations – ANOVA – One-way and two-way classification (without interactions).

## Unit – III

Basic designs – CRD, RBD and LSD and their Analysis – Missing plot technique for RBD & LSD (One and two missing values) - Efficiency of LSD over RBD and CRD.

### Unit IV

Factorial experiments: Concept of main effects and interactions pxq,  $2^2$ ,  $2^3$ ,  $2^4$  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) and Strip plot design (only two factors).

## **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., Culcutta.
- 3. M.N.Das and N.C.Giri, (1998), Design and Analysis of experiments, Wiley Eastern Ltd, New Delhi.
## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – V CORE PAPER– X (ELECTIVE – I) 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

Simple queuing models (M/M/1, M/M/s queuing system) – Steady State Solutions – Simple problems.

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

- 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.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – V CORE PAPER – XI (ELECTIVE – II) ACTUARIAL STATISTICS

#### 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.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – V SBEC-II REGRESSION ANALYSIS

## Unit – I

Concept of correlation and its types

### Unit – II

Linear and Non-linear regression - concepts only.

#### Unit – III

Curve fitting – methods – explanation.

#### Unit – IV

Curve fitting – fitting of linear regression.

### Unit – V

Curve fitting – fitting of non-linear regression.

- 1. S.C.Gupta and V.K.Kapoor (2004): Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.
- 2. J.K.Kapoor and H.C.Sexena (1989) : Mathematical Statistics, Sultan Chand and Sons, New Delhi.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – V SBEC-III GENETICAL STATISTICS

## Unit – I

Chromosomes and Genes - meaning of basic terms

### Unit – II

Genotype and phenotype, dominance & recessiveness.

## Unit – III

Autosomal linkage - crossing over – sex – linked inheritance sample space – Random events – probability.

#### Unit – IV

Compound events – Laws of probability – conditional probability – Rendel's laws (I & II)

### Unit – V

Genotypes and phenotypes in experimental populations – No.of genotypes and phenotypes – Evaluation of phenotypic ratios in the off spring of inter crosses and back crosses, using generating function.

#### **References Books:**

 Ragira C. Elandt : Probability models and Statistical methods in Genetics, John – Wiley and Sons Inc, New Delhi.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – V SBEC-IV 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 Whiteney 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.

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

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY

#### **B.Sc. Degree Examination**

### **Branch** – Statistics

## SEMESTER – V

### PAPER - VIII

#### **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.Define analysis of variance

4. What is contingency table?

5.Distinguish between small sample and large sample test

6. Outline the large sample test for correlation coefficient

7. What is the importance of paired t-test?

8. State any two uses of LR test?

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) Outline the procedure of ANOVA of one-way classification

or

b)Explain the  $\chi^2$  test procedure for testing the independence of attributes.

13)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.

14.a)Define LR test and state its properties

Or

b)Explain paired t-test procedure.

15.a)What is average sample number?

What purpose does this serve in SPRT?

or

b)Explain the need for sequential rules.

#### $Part - C (3 \times 10 = 30)$

#### Answer any THREE question

- 16.State and prove Neyman-Pearson Lemma. Mention its importance.
- 17.Derive the analyse of variance for two way classification stating clearly the assumptions.
- 18.Explain the large sample test procedure for testing the equality of proportions for unequal sample size from two populations.
- 19.Explain the relationship, between testing of hypothesis and confidence interval giving example.
- 20.Explain the procedure of SPRT and state its OC and ASN functions. Mention the importance of SPRT.

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY

**B.Sc. Degree Examination** 

**Branch** – Statistics

## SEMESTER - V

#### **CORE PAPER - IX**

#### **DESIGN OF EXPERIMENTS**

Time : 3 Hours

#### Maximum : 75 Marks

#### Part - A (10 x 2 = 20)

#### **Answer ALL questions**

1)What are uniformity trials?

2)State the use of Tukey's test.

3)Explain the need for transformation of data?

4)State the assumptions involved in ANOVA.

5)What do you mean by efficiency of a 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)How split plot design differs from basic designs?

10)Write down the mathematical model for strip-plot design.

#### Part - B (5 x 5 = 25)

#### **Answer ALL Questions**

11)a)Explain least significant difference test

or

b)Define the terms:

(i)Block (ii)treatment (iii)plot (iv)Comparative experiment

12)a) Explain the concept of 'ANOVA'

or

b)Distinguish between one-way & two-way classifications giving suitable example.

13)a)State any five advantages of CRD.

or

b)Explain how the randomisation 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<sup>2</sup> factorial experiment.

## $Part - C (3 \times 10 = 30)$

### Answer any THREE questions

16) Describe the basic principles of experimentation

17) Discuss square root and Angular transformations of data.

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.

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch** – Statistics

### SEMESTER – V

#### CORE PAPER - X

### **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 poisson process.

9. What is traffic intensity?

10. What do you mean by a markovian queue?

#### Part - B (5 x 5 = 25)

#### **Answer ALL questions**

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

or

b)Explain how do 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 poisson 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  $\lambda$  has a negative exponential distribution with mean  $1/\lambda$ 

15.a)Explain Kendal's notation to specify a queuing model.

or

b.Develop the differential – difference equation of M / M / 1 queuing model.

## 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. Derive the steady-state solution of (M / M / 1) queueing model.

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

#### **B.Sc. Degree Examination**

#### **Branch – Statistics**

## $\mathbf{SEMESTER}-\mathbf{V}$

#### **CORE PAPER - XI**

## **ACTUARIAL STATISTICS**

Time : 3 Hours

Maximum : 75 marks

#### Section $-A(10 \ge 2 = 20)$

#### **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 $- B (5 \times 5 = 25)$

#### **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 halfyearly 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 payments required? What is the position of the fund at the end of 8 years?

Age in years	l <sub>x</sub>	d <sub>x</sub>	<b>p</b> <sub>x</sub>	q <sub>x</sub>	L <sub>x</sub>	T <sub>x</sub>	e <sup>0</sup> <sub>x</sub>
4	95000	500	?	?	?	4850300	?
5	?	400	?	?	?	?	?
	or						

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

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

Age	lv	dv	av	ny	
X	14			P <sup>A</sup>	
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<sup>st</sup> payment and (ii) 5<sup>th</sup> 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 Assurance.

## PERIYAR UNIVERSITY, SALEM

## **B.Sc., STATISTICS**

## **CBCS PATTERN**

## SYLLABUS AND MODEL QUESTIONS

## (for candidates admitted from 2008-09 onwards)

## **SEMESTER – VI**

Part	Course title	No.of	Hours /	Credit	Ι	Marks	-
1 411		courses	week	Creun	CIA	UE	Total
III	Core paper XII:	1	5	5	25	75	100
	Statistical Quality						
	Control						
	Core Paper XIII :	1	5	5	25	75	100
	Demography						
	Core Paper XIV :	1	5	5	25	75	100
	Applied Statistics						
	Core Paper XV :	1	5	5	25	75	100
	Elective III :						
	Numerical Analysis						
	Core paper XVI :	1	3	3	40	60	100
	Major Practical III						
	Core paper XVII :	1	3	3	40	60	100
	Major Practical IV						
IV	SBEC - V :	1	2	2	25	75	100
	Statistical						
	Forecasting						
	SBEC – VI :	1	2	2	25	75	100
	Econometrics						
V	Extension Activities	1	-	1	-	-	-
	Total	9	30	31	-	-	-

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – VI CORE PAPER – XII STATISTICAL QUALITY CONTROL

## 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 – Rational subgroups – Control charts for variables ( $\overline{X}$ , R and S – Charts) – Sloping control charts – Uses of control charts.

#### 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

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

- 1. M.Mahajan (2001), Statistical quality control, Dhanpat Rai & co (p) Ltd., Delhi.
- 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.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – VI CORE PAPER – XIII DEMOGRAPHY

#### Unit – I

Source of demographic data – Vital Registration – Population Census – Population Registers – Errors in Demographic Data – Methods of improvements.

#### Unit – II

Rates and Ratios – Fertility Measures – General and Specific fertility rates – Total fertility rates – growth rates – Gross – Reproduction rates – Net Reproduction Rates.

#### Unit – III

Mortality measures – Crude and Specific rates – Standardised rates – comparative mortality index – Force of mortality – Gompertz and Makehams laws.

#### Unit – IV

Life table – Structure – Construction – Relationship between the functions of life tables – Population projection – Component method of population projection.

#### Unit – V

Migration – Types of Migration – Migration Rates – Hamilton's Rates – Net migration rates – Methods of estimating net migration rates.

- 1. R.Ramkumar, (1986): Technical Demography, Wiley Eastern Ltd, New Delhi.
- S.C.Gupta, V.K.Kapoor, (2007):Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi
- Bhakar D.Misra (1980): An introduction to the study of population, South Asian Publishers Pvt Ltd., New Delhi.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – VI CORE PAPER - XIV 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 – Methods of fitting polynomial curves and logistic curves – Semi average method – Method of moving average.

### Unit – II

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

#### Unit – III

Basis of Index Numbers – Definition – Problems in the construction – Different types of Index Numbers – Simple Index Numbers – Weighted Index Numbers – Laspeyres Index Numbers – Paasche's Index Numbers – Fisher's Index Numbers – Marshall – Edge worth Index Numbers – Dorbish – Bowley's Index Numbers – Errors in Index Numbers.

#### Unit – IV

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

## Unit – V

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

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

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – VI CORE PAPER – XV (ELECTIVE – III) 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.

- 1. G.Shanker Rao, Numerical Analysis (New Age International Publications)
- 2. S.S.Shastry, (1994), Numerical Analysis (Prentice Hall).
- 3. K.E.Aitkinson, An introduction to Numerical Analysis (John Wiley and sons)
- 4. V.Rajaraman, Computer Orinted Numerical Methods (Prentice Hall).
- 5. P.Scheild, (1968), Numerical Analysis (Schaum Series).

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – VI CORE PAPER – XVI MAJOR PRACTICAL – III

#### Unit – I

Testing of hypothesis on the parameters of Binomial, Normal, Exponential and Couchy distributions, When alternatives are one – sides / two sided.

### Unit – II

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

#### Unit – III

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

#### Unit – IV

Construction of control charts for variables :  $\overline{X}$ , R and S charts.

Control charts for attributes of fixed and varying sample size -p, np and C charts.

#### Unit – V

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

#### 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 CBCS PATTERN (2008-2009) SEMESTER – VI CORE PAPER – XVII MAJOR PRACTICAL – IV

## Unit – I

Fertility rates – TFR, GRR and NRR – Mortality rates – ASDR, Infant Mortality Rate, Standardized Death Rate – Construction of Complete life table.

#### Unit – II

Estimation of trend by moving averages, Least square methods – Computation of quarterly and monthly trends – Estimation of seasonal indices by simple average method.

#### Unit – III

Estimation of seasonal Indices by Ratio-to-trend, Ratio-to-moving Average and link relative methods.

#### Unit – IV

Variate – Difference method – Calculation of unweighted Index numbers – Weighted Index Numbers.

### Unit – V

Cost of living index Number – Family budget method – Total expenditure method – Fixed base to chain base and chain base to fixed base.

#### 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 CBCS PATTERN (2008-2009) SEMESTER – VI SBEC-V STATISTICAL FORECASTING

## Unit – I

Concept of passial 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)

- 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.

## B.Sc. STATISTICS CBCS PATTERN (2008-2009) SEMESTER – VI SBEC-VI ECONOMETRICS

## Unit – I

Introduction to Econometrics – Nature and scope of Econometrics – Limitations.

#### Unit – II

Concepts of price, Demand, supply, elasticity of demand, elasticity of price, elasticity of supply – simple problem.

#### Unit – III

Simple linear model and general linear models – Simple application.

#### Unit – IV

Ordinary Least Square (OLS) estimation – Prediction – Simple illustrations.

#### Unit – V

Statistical problems of Econometric methods – Hetroscedasiticity and Multi collinearity.

- 1. J.Johnston (1985) Econometric methods, John Wiley & Inc, New York.
- 2. S.P.Singh, Anil.K, Parashar and H.P.Singh (1984). Econometrics, S.Chand and Company Ltd, New Delhi.

## MODEL QUESTION PAPER PERIYAR UNIVERSITY, SALEM B.Sc. Degree Examination Branch – Statistics SEMESTER – VI CORE PAPER - XII 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  $\sigma$  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.

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch – Statistics** 

## SEMESTER – VI

### **CORE PAPER - XIII**

#### DEMOGRAPHY

## Time: 3 Hours.

Maximum:75 marks

## Part – A (10 X 2 = 20) Answer ALL questions

1. What is demography?

- 2. What is meant by vital Registration System?
- 3. Differenciate between Rate and Ratio.
- 4. Define vital statistics.
- 5. Define infant mortality rate.
- 6. Define endogeneous infant death.
- 7. What are the types of life table?
- 8. What are the forces of mortality?
- 9. Define migration.
- 10. Write any two migration models

## Part - B (5 x 5 = 25)

#### **Answer ALL questions**

11.a.Explain briefly the VRS in India

or

b. Explain the scope and importance of data collection in population census.

12.a.Describe general fertility rate and compare it with crude birth rates.

or

b. Interpret NRR using the following data.

Country: Canada Egypt IndiaJapan DenmarkCostaricaNRR: 1.803.782.770.961.303.34

13.a. Derive the Gompertz law for  $\mu_x$  and  $l_x$ .

or

b. Define standardized death rate and comparative mortality index.

14.a.State the uses of life table

or

b.Prove that  $qx = \frac{2m_x}{2+m_x}$  with usual notation.

15.a.How would you measure migration?

Write down the various migration models.

or

b.Briefly explain Hamilton's Migration rate.

### Part -C (3 X 10 = 30)

## **Answer any THEE Questions**

16.Mention the important characteristic of population census in India.

17. What do you mean by the fertility of a population? Discuss the relative merits and demerits of various measures of fertility.

18.Explain any method of fitting of Macham's law for lx.

19. Write down the assumptions, descriptions and constructions of life tables.

20.Explain the different types of migration.

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch** – Statistics

SEMESTER – VI

#### PAPER - XIV

#### **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

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.

b)Explain briefly the periodogram analysis.

13.a)Prove that Fisher's Index Number lies between laspeyre's and paachey'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)Out line the uses of cost of Living Index Numbers.

#### $Part - C (3 \times 10 = 30)$

#### **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
А	2	3	4	2	7
В	3	6	9	4	3
С	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.

## **MODEL QUESTION PAPER**

#### PERIYAR UNIVERSITY, SALEM

**B.Sc. Degree Examination** 

**Branch** – Statistics

## SEMESTER - VI

#### **CORE PAPER - XV**

#### NUMERICAL ANALYSIS

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  $\Delta$ .

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

6)What are the assumptions of Lagranges 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)Describe the method of Regula-Falsi position to solve an equation f(x) = O

or

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

12)Discuss briefly the shift operator.

or

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)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.

Interpolate f(2) from the following data.

or

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

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

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

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

or

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

Х	:	1	2	4	8	10	
y = f	(x):	0	1	5	21	27	
Dete	rminir	ne nume	erically	the fir	st deriv	ative at	$\mathbf{x} = 4$

20.Calculate by simpson's 1/3<sup>rd</sup> rule an approximate value of

 $\int_{x^4}^{3} dx$  by taking seven equidistant ordinates.

# MODEL QUESTION PAPER PERIYAR UNIVERSITY, SALEM – 11 B.Sc. Degree Examination Branch – Statistics SEMESTER – VI CORE PAPER - XVI MAJOR PRACTICAL - III

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  $H_0: \theta = 2$ , Vs  $H_1: \theta = 1$  use he random sample  $x_1, x_2$  of size 2 and define a critical region : w :  $\{(x_1, x_2)\}: 9.5 \le x_1 + x_2\}$ 

Find (i) Power of the test

(ii) Significance level of the test

2. 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								
DIOCKS	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			
Blocks	Yields								
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I	1	k	р	kp					
1	23	25	22	38					
II	р	1	k	kp					
	40	26	36	38					
III	1	k	kp	р					
	29	20	30	20					
IV	kp	k	р	1					
	34	31	24	28					

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

- 4. The following are the figures of defectives in 22 lots each containing 2,000 rubber belts;
  425, 430, 216, 341, 225, 322, 280, 306, 337, 305, 356, 402, 216, 264, 126, 409, 193, 326, 280, 389, 451, 420.
  Draw p-chart an comment on state of control of the process.
- 5. For the single sampling plan

N = 2000, n = 100, c = 2

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

## MODEL QUESTION PAPER PERIYAR UNIVERSITY, SALEM – 11 B.Sc. Degree Examination Branch – Statistics SEMESTER – VI CORE PAPER - XVII MAJOR PRACTICAL - IV

Time : 3 Hours

Maximum: 60 marks

## Answer any THREE questions All questions carry EQUAL marks

1. Given the following table for lx; the number of pigs living at age x, complete the life table for the pigs.

X:	0	1	2	3	4	5	6
Lx:	100	90	80	75	60	30	0

Let A, B, and C are three pigs aged 1, 2 and 3 years respectively.

Find the chance that

- (i) at least one of them will be alive for one more year.
- (ii) All will be alive for two years time.
- (iii) One of the three will be alive for two years.
- (iv) All will be died in two years time.

2. 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 2009.

 Calculate the seasonal indices for the following data by the method of Ratio-tomoving average

Year	Quarter					
	Ι	II	III	IV		
1998	12	15	14	16		
1999	15	18	18	20		
2000	20	23	25	20		
2001	22	25	27	30		

4. Find Fisher's Ideal index from the following data

Commodity	20	03	2005		
	Price	Quantity	Price	Quantity	
A	3	8	5	10	
В	5	12	7	15	
С	12	7	15	10	
D	10	13	10	15	

Also show that Fisher index is an ideal index.

5. Find the cost of lining index from the following data by using

i) Aggregate expenditure method

ii) Family budget method

Commodity	Quantity	Price		
	Quantity	2003	2005	
A	10	4	5	
В	8	8	8	
С	13	10	12	
D	15	9	10	