

# SRI VENKATESWARA UNIVERSITY

CBCS B.A./B.Sc. Statistics Course Structure

W.E.F.2017-18

3<sup>rd</sup> YEAR - VI SEMESTER

## STATISTICS

Year	Sem	Paper	Subject	Hrs	Cridets	IA	EA	Total
3	VI	VII	Elective(A)					
			Applied Statistics - I	3	3	25	75	100
			LAB	2	2	-	50	50
		Cluster Elective (A)						
		VIII	A-I : Operations Research	3	3	25	75	100
			A-II :Advanced Operations Research	3	3	25	75	100
			A-III : Numerical Analysis	3	3	25	75	100
			A-I : LAB	2	2	-	50	50
			A-II : LAB	2	2	-	50	50
			A-III : LAB	2	2	-	50	50

**SRI VENKATESWARA UNIVERSITY**  
**STATISTICS SYLLABUS**  
Semester – VI (CBCS With Maths Combination Common to BA/BSc)  
Elective Paper – VII(A) : APPLIED STATISTICS - I

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**UNIT – I**

**Time series** : Introduction, Components of Time Series, Analysis of time series, Uses of time series, Measurement of trend : Graphical method, Semi averages, moving averages and trend lines by straight line and parabola.

**UNIT – II**

**Seasonal Indices** : Simple average method, Ratio to moving average method, Ratio to trend method and Link relatives method.

**UNIT – III**

**Index Numbers**: Introduction, Applications and Limitations of index numbers, Problems involved in the construction of index numbers, Simple and weighted index numbers, Criteria of good index number, Chain base and fixed base index numbers. Base shifting and Splicing of index numbers. Construction of Cost of living index numbers

**UNIT – IV**

**Vital Statistics** : Introduction, Uses of vital statistics, Methods of obtaining vital statistics, Measurement of mortality: CDR, S.D.R and St.D.R , Fertility rates: CBR, GFR, SFR and TFR , Population growth rates: Pearl's vital index, GRR and NRR. Construction of Life Table.

**UNIT – V**

**Official statistics** : Present official statistical system in India, Functions and organization of Central Statistical Organization (CSO) and National Sample Survey Organization (NSSO). National Income, Basic concepts of National Income, Uses of National Income, Methods of Estimating National Income.

**List of reference books:**

1. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2008): Fundamentals of Statistics, Vol. II, 9th Edition World Press, Kolkata.
2. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals of Applied Statistics, 4<sup>th</sup> Edition (Reprint), Sultan Chand & Sons
3. B.A/B.Sc III Year Paper-III Statistics- Applied Statistics- Telugu Academic by Prof.K.Srinivasa Rao, Dr.D. Giri, Dr.A.Anand, Dr.V.Papaiah Sastry
4. B.A/B.Sc Statistics, Applied Statistics Paper-III, Kalyani Publishers
5. K.V.S. Sarma: Statistics Made Simple: do it yourself on PC. PHI.

## **STATISTICS PRACTICALS**

Semester – VI (CBCS With Maths Combination Common to BA/BSc)

Elective Paper – VII(A) : APPLIED STATISTICS - I

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1. Calculation of trend values by Moving Average Method(Odd & Even Period)
2. Calculation of trend values by Linear Trend method
3. Calculation of seasonal indices by Simple Average Method
4. Calculation of seasonal indices by Ratio to Moving Average Method
5. Calculation of seasonal indices by Ratio – to- Trend Method
6. Calculation of seasonal indices by Link Relatives Method
7. Calculation of simple and weighted price relative index numbers
8. Calculation of different Weighted index numbers
9. Construction of Fisher Good Index number
10. Construction of Cost of living index number

**SRI VENKATESWARA UNIVERSITY**  
**STATISTICS MODEL QUESTION PAPER**  
Semester – VI (CBCS With Maths Combination Common to BA/BSc)  
Elective Paper – VII(A) : APPLIED STATISTICS -I  
(w.e.f. 2017-18)

**(Scientific calculators are allowed)**

Time:3 Hours

Max.Marks:75

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**PART - A**

Answer any **FIVE** of the following questions. Each question carries 5 Marks 5 X 5 = 25M

1. Define Time Series. Also write its Uses ?
2. Explain for finding trend values by fitting of straight line ?
3. Explain the method of simple averages to determine seasonal variations ?
4. Explain various simple index numbers
5. Explain the Procedure to construct the cost of living index number ?
6. Explain fixed base and chain base index numbers ?
7. Define Vital Statistics and write its Uses ?
8. Write uses of National Income ?

**PART-B**

Answer **ALL** questions. Each question carries 10 Marks

5X10=50M

**UNIT - I**

9. Explain the method of fitting parabolic trend in time series analysis ?

OR

10. Explain components of time series ?

**UNIT – II**

11. Describe the measurement of seasonal variations by ratio-to-moving average method ?

OR

12. Describe the measurement of seasonal variations by ratio-to-trend method ?

**UNIT - III**

13. Explain the Problems involved in the construction of Index numbers ?

OR

14. Explain test of reversibility ?

#### **UNIT - IV**

15. Explain various rates of fertility ?

OR

16. Explain the construction and Uses of life table ?

#### **UNIT – V**

17. What are the main functions of CSO and NSSO ?

OR

18. Explain Methods of Estimating National Income ?

## **SRI VENKATESWARA UNIVERSITY**

### **STATISTICS SYLLABUS**

Semester – VI (CBCS With Maths Combination Common to BA/BSc)

Cluster Elective Paper – VIII(A-1) : OPERATIONS RESEARCH

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#### **UNIT –I**

**Introduction:** Origin and development of OR, Nature and features of OR, Modeling in OR, Phases of OR. Applications and Limitations of OR.

#### **UNIT – II**

**Linear Programming Problem:** Introduction, Mathematical formulation of the LPP, Canonical and standard form of LPP. Graphical solution of a Linear Programming Problem, Problems.

#### **UNIT – III**

**Solution of LPP:** Definitions of BFS, IBFS, Degenerate solution, Slack and Surplus variables, Optimum solution, Computational procedure of Simplex method, Big- M method and Two-phase simplex method and Problems.

#### **UNIT – IV**

**Transportation Problem:** Introduction, Transportation Table, General Transportation problem Initial basic feasible solution (IBFS) by North West Corner Rule, Least cost method and Vogel's Approximation Method (VAM), Un-Balanced Transportation Problem, Maximization Transportation Problem

#### **UNIT –V**

**Assignment problem:** Introduction, Mathematical formulation of the problem, Optimal solution by Hungarian method. Un balanced and Maximization case in assignment problem, The travelling salesman problem.

### **List of reference books:**

1. Taha, H. A. (2007): Operations Research: An Introduction, 8th Edition, Prentice Hall of India.
2. KantiSwarup, Gupta, P.K. and Manmohan (2007): Operations Research, 13th Edition, Sultan Chand and Sons.
3. B.A/B.Sc III Year Paper-IV Statistics- applied Statistics- Telugu Academic by Prof.K.Srinivasa Rao, Dr.D. Giri, Dr.A.Anand, Dr.V.Papaiah Sastry
4. B.A/B.Sc Statistics, Applied Statistics Paper-III, Kalyani Publishers
5. S.Kalavathi, Operations Research, 2<sup>nd</sup> Edition, Vikas

## **STATISTICS PRACTICALS**

Semester – VI (CBCS With Maths Combination Common to BA/BSc)  
Cluster Elective Paper – VIII(A-1) : OPERATIONS RESEARCH

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1. Formulation of LPP
2. Solution of LPP by Graphical Method
3. Solution of LPP by Simplex Method
4. Solution of LPP by Big M Method
5. Solution of LPP by Two Phase Simple method
6. Solution of TP by North West Corner Rule to find IBFS
7. Solution of TP by Least Cost Method to find IBFS
8. Solution of TP by VAM to find IBFS
9. Solution of Unbalanced TP
10. Solution of Maximization TP
11. Solution of Assignment problem by Hungarian Method
12. Solution of unbalanced Assignment problem.
13. Solution of traveling salesman problem.

**SRI VENKATESWARA UNIVERSITY**  
**STATISTICS MODEL QUESTION PAPER**  
Semester – VI (CBCS With Maths Combination Common to BA/BSc)  
Cluster Elective Paper – VIII(A-1) : OPERATIONS RESEARCH  
(w.e.f. 2017-18)

**(Scientific calculators are allowed)**

Time:3 Hours

Max.Marks:75

**PART -A**

Answer any FIVE of the following questions. Each question carries 5 Marks      5X5=25M

1. What is meant by OR ?
2. Write Canonical and standard form of LPP ?
3. Write the procedure of Solving LPP by graphical method ?
4. Write Mathematical formulation of the LPP ?
5. Explain the following terms ?  
(1) Slack Variable (2) Surplus Variable with example
6. Explain Big M-Method ?
7. Find IBFS by North West corner rule ?

	D1	D2	D3	D4	Supply
S1	3	7	6	4	5
S2	2	4	3	2	2
S3	4	3	8	5	3
Demand	3	3	2	2	

8. What is an assignment Problem? Explain mathematical representation of Assignment problem ?

**PART-B**

Answer **ALL** questions. Each question carries 10 Marks.

5X10=50M

**UNIT - I**

9. Write applications of Operation Research ?

**OR**

10. Explain phases of Operation Research ?



## UNIT - II

11. A firm can produce 3 types of cloth, A, B and C. Three kinds of wool are required Red, Green and Blue. 1 unit of length of type A cloth needs 2 meters of red wool and 3 meters of blue wool. 1 unit of length of type B cloth needs 3 meters of red wool, 2 meters of green wool and 2 meters of blue wool. 1 unit type of C cloth needs 5 meters of green wool and 4 meters of blue wool. The firm has a stock of 8 meters of red, 10 meters of green and 15 meters of blue. It is assumed that the income obtained from 1 unit of type A is Rs.3, from B is Rs.5 and from C is Rs.4. Formulate this as an LPP.

(OR)

12. Solve the following LPP by using graphical method.

$$\begin{aligned} &\text{Maximize} && Z=2X_1+X_2 \\ &\text{Subject to} && X_1+2X_2 \leq 10; \quad X_1+X_2 \leq 6; \quad X_1-X_2 \leq 2; \quad X_1-2X_2 \leq 1 \\ &&& \text{and} \quad X_1, X_2 \geq 0 \end{aligned}$$

## UNIT - III

13. Describe the Computational Procedure of the Simplex method for the solution of LPP?

(OR)

14. Solve the following LPP by two Phase Simplex method

$$\begin{aligned} &\text{Maximize} && Z=3X_1+2X_2 \\ &\text{Subject to} && 2X_1+X_2 \leq 2 \\ &&& 3X_1+4X_2 \geq 12 \\ &&& X_1, X_2 \geq 0 \end{aligned}$$

## UNIT - IV

15. Find IBFS for the following T.P by VAM ?

Origins	Destinations				Supply/ Available
	D	E	F	G	
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand/ requirement	200	225	275	250	

(OR)

16. Explain North-west corner rule and Lowest cost entry method of finding IBFS ?

UNIT - V

17. Solve the following Assignment Problem ?

Jobs	Persons				
	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>	P <sub>5</sub>
J <sub>1</sub>	3	8	2	10	3
J <sub>2</sub>	8	7	2	9	7
J <sub>3</sub>	6	4	2	7	5
J <sub>4</sub>	8	4	2	3	5
J <sub>5</sub>	9	10	6	9	10

OR

18. Explain Hungarian method of solving assignment problem

## SRI VENKATESWARA UNIVERSITY

### STATISTICS SYLLABUS

Semester – VI (CBCS With Maths Combination Common to BA/BSc)  
Cluster Elective Paper – VIII(A-II) : ADVANCED OPERATIONS RESEARCH

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#### UNIT – I

**Sequencing Problem:** Introduction, Principal assumptions, Basic terms used in sequencing, Optimum Sequence Algorithm(Johnston Algorithm) processing  $n$  Jobs through two machines, Processing  $n$  Jobs through three machines and  $K$  machines

#### UNIT-II

**Game theory:** Introduction, Definition, Payoff matrix , Types of games, Saddle point, Games with out saddle point, Graphical method for  $2 \times n$  or  $m \times 2$  games, Maximin-Minimax principle, Solution to rectangular game using graphical method, Dominance property to reduce the game matrix and solutions.

#### UNIT-III

**Queuing System:** Introduction, Queuing system, Arrival pattern, Service mechanism, Queue discipline, Customer's behavior, Transient and steady states, Traffic intensity, Kendall's notation for representing Queuing models, Classification of Queuing models, Problems on Model -1 (  $M/M/1$  : with finite and infinite system capacity) only.

#### UNIT – IV

**Network:** Introduction, Basic terms, Rules of network construction, Numbering the events (Fulkerson,s Rule), Construction of Network, Algorithm and problems on Critical Path method(CPM) and Program evaluation and review technique (PERT).

#### UNIT – V

**Simulation:** Definition, Types of simulation, Random variable, Random number, Pseudo-random numbers, Monte-Carlo Technique, Generation of random numbers and problems.

List of reference books:

1. Taha, H. A. (2007): Operations Research: An Introduction, 8th Edition, Prentice Hall of India.
2. KantiSwarup, Gupta, P.K. and Manmohan (2007): Operations Research, 13th Edition, Sultan Chand and Sons.
3. B.A/B.Sc III Year Paper-IV Statistics- applied Statistics- Telugu Academic by Prof.K.Srinivasa Rao, Dr.D. Giri, Dr.A.Anand, Dr.V.Papaiah Sastry
4. S.Kalavathi, Operations Research, 2<sup>nd</sup> Edition, Vikas

## **STATISTICS PRACTICALS**

Semester – VI (CBCS With Maths Combination Common to BA/BSc)  
Cluster Elective Paper – VIII(A-II) : ADVANCED OPERATIONS RESEARCH

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1. N jobs through two machines
2. N jobs through three machines
3. N jobs through K machines
4. Graphical method for  $2 \times n$  or  $m \times 2$  games
5. Principle of Dominance find the value of game matrix.
6. Measures of Model I
7. Critical Path Method(CPM)
8. Programme Evaluation and Review Technique(PERT)
9. Monte -carlo technique of simulation

**SRI VENKATESWARA UNIVERSITY**  
**STATISTICS MODEL QUESTION PAPER**  
Semester – VI (CBCS With Maths Combination Common to BA/BSc)  
Cluster Elective Paper – VIII(A-II) : ADVANCED OPERATIONS RESEARCH  
(w.e.f. 2017-18)

**(Scientific calculators are allowed)**

Time:3 Hours

Max.Marks:75

**PART -A**

Answer any FIVE of the following questions. Each question carries 5 Marks      5X5=25M

1. Define the Problem of Sequencing and Explain its assumptions.
2. We have five jobs each of which must go through the two machines A and B in the order AB. Processing times in hours are given in the table below.

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

Determine the optional sequence that will minimize the elapsed Time.

3. Describe Payoff Matrix ?
4. Explain Maximin-Minimax principle?
5. Explain customer's behavior ?
6. Define the terms Network, Activity, Event ?
7. Explain rules of network construction ?
8. Define simulation

**PART-B**

Answer **ALL** questions. Each question carries 10 Marks.

5X10=50M

**UNIT - I**

9. Describe the method of Processing n 'jobs through three machines.

(OR)

10. Determine the optional sequence of jobs that minimize the total elapsed time based on the following information Processing time on machines is given in hours and passing is not allowed.

Job :	A	B	C	D	E	F	G
M <sub>1</sub> :	3	8	7	4	9	8	7
M <sub>2</sub> :	4	3	2	5	1	4	3
M <sub>3</sub> :	6	7	5	11	5	6	12

## UNIT - II

11. Explain graphical method of  $2 \times n$  or  $m \times 2$  games ?

(OR)

12. Solve the following payoff matrix, determine the optimal strategies and the value of game

$$A \begin{matrix} & B \\ \begin{matrix} 5 & 1 \\ 3 & 4 \end{matrix} \end{matrix}$$

## UNIT – III

13. Explain queueing system ?

(OR)

14. The mean arrival rate to a service centre is 3 per hour. The mean service time is found to be 10 minutes per service. Assuming Poisson arrival and exponential service time, find (i) The utilization factor for this service facility (ii) The probability of two units in the system (iii) The expected number of units in the system (iv) The expected time in minutes that a customer has to spend in the system.

## UNIT – IV

15. A small maintenance project consist of the following jobs whose precedence relationships is given below.

Job	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration(days)	15	15	3	5	8	12	1	14	3	14

Draw an arrow diagram representing the project (ii) Find the total float for each activity?

## UNIT - V

16. Explain Monte-Carlo Technique of simulation ?

OR

17. A manufacturing company keeps stock of a special product. Previous experience indicates the daily demand as given below.

Daily Demand	5	10	15	20	25	30
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Simulate the demand for the next 10 days. Also find the daily average demand for the product on the basis of simulated data ?

## SRI VENKATESWARA UNIVERSITY

### STATISTICS SYLLABUS

Semester – VI (CBCS With Maths Combination Common to BA/BSc)

Cluster Elective Paper – VIII (A-III) : NUMERICAL ANALYSIS

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#### UNIT – I

**Finite Differences:** Definitions of operators  $\Delta$ ,  $\nabla$  and  $E$ , - Properties - Relationship among operators-Difference Table- Uses- Estimation of single and Two Missing values- Newton's Binomial expansion rule- Problems

#### UNIT – II

**Interpolation and Extrapolation:** Assumptions- uses- Newton's forward formula- Newton's back ward formula- Interpolation at unequal intervals- Divided differences-properties- Newton's divided differences formula- Lagrange's formula- Problems

#### UNIT – III

**Central Difference:** Uses – Gauss Forward and Backward formulae- Sterling's formula- Bessel's formula- Laplace everett's formula - Problems

#### UNIT – IV

**Numerical Differentiation:** First and Second order derivatives-Newton's forward and Backward Differentiation formulae-, Gauss Forward and Backward differentiation formulae- Sterling's and Bessel's differentiation formulae- Problems

#### UNIT – V

**Numerical Integration:** Importance- General Quadrature rule- Trapezoidal Rule- Simpson's - 1/3 Rule- Simpson's -3/8 Rule –Weddle's Rule - Problems

### List of reference books:

1. Statistical Methods by S.C.Gupta,
2. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals of Mathematical Statistics, New Edition(Reprint), Sultan Chand & Sons
3. Statistics and Numerical methods by Dr. A. Singaravelu, ARS Publications.

## **STATISTICS PRACTICALS**

Semester – VI (CBCS With - Maths Combination Common to BA/BSc)

Cluster Elective Paper – VIII (A-III) : NUMERICAL ANALYSIS

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1. Missing values by Binomial Expansion method
2. Newton's forward formula
3. Newton's back ward formula
4. Lagrange's formula
5. Gauss forward central formula
6. Gauss backward central formula
7. Sterling's central difference formula
8. Bessel's central difference formula
9. Laplace-Everett's central difference formula
10. Gauss forward differentiation formula
11. Gauss backward differentiation formula
12. Sterling's differentiation formula
13. Bessel's differentiation formula
14. Laplace-Everett's differentiation formula
15. Trapezoidal Rule
16. Simpson's  $\frac{1}{3}$  and  $\frac{3}{8}$  rule



**SRI VENKATESWARA UNIVERSITY**  
**STATISTICS MODEL QUESTION PAPER**  
Semester – VI (CBCS With Maths Combination Common to BA/BSc)  
Cluster Elective Paper – VIII(A-III) : NUMERICAL ANALYSIS  
(w.e.f. 2017-18)

**(Scientific calculators are allowed)**

Time: 3 Hours

Max. Marks: 75

**PART- A**

Answer any **FIVE** questions. Each question carries **FIVE** marks

5 X 5 = 25 Marks

1. Define (a) Forward difference operator (b) Backward difference operator (c) Shift operator and also obtain the relations between them
2. (i) Prove that  $e^x = \left(\frac{\Delta^2}{E}\right) e^x \cdot \frac{E e^x}{\Delta^2 e^x}$   
(ii) Evaluate  $\Delta^2(e^{ax+b})$  the interval of differencing being unity.
3. Explain interpolation? Also discuss the assumptions of interpolation.
4. The value of x and y are given below  
X : 5 6 9 11  
Y : 12 13 14 16  
Find the value of x when y = 15
5. Obtain the relation between divided differences and ordinary differences.
6. Find the first derivative of the function  $f(\theta) = \tan \theta$  tabulated below at the point  $\theta = 3^0$   

$\theta$	:	$0^0$	$5^0$	$10^0$	$15^0$
$\tan \theta$	:	0.0000	0.0875	0.1763	0.2679
7. Derive the formula for Simpson's  $\frac{3}{8}$ th rule.
8. Evaluate  $\int_0^6 \frac{dx}{1+x^2}$  by using Weddle's rule and also compare with the exact value.

**PART -B**

Answer **ALL** questions. Each question carries **TEN** marks

5 X 10 = 50M

**UNIT – I**

9. Show that if  $f(x)$  be a polynomial of  $n^{\text{th}}$  degree in x then the  $n^{\text{th}}$  difference of  $f(x)$  is constant and  $(n+1)^{\text{th}}$  and the higher order difference of  $f(x)$  are zero.

(OR)

10. Estimate the missing values in the following table

x	:	1	2	3	4	5	6	7
f(x)	:	2	--	8	---	32	64	128

## UNIT - II

11. Derive the Newton-Gregory backward difference interpolation formula.

(OR)

12. Use Gauss's forward formula to find the value of  $y$  when  $x = 3.75$  from the following table

X	:	2.5	3.0	3.5	4.0	4.5
Y	:	24.145	22.043	20.225	18.644	17.262

## UNIT - III

13. Derive the Newton's divided difference formula.

(OR)

14. The following table Estimate the weight of the baby at the age of 7 months by using Lagrange's interpolation formula.

Age in months	:	0	2	5	8	10	12
Weights in lbs	:	7.5	10.25	15	16	18	21

Estimate the weight of the baby at the age of 7 months by using Lagrange's formula

## UNIT - IV

15. Find the first and second derivatives of the function tabulated below when  $x = 1.1$

x	:	1.0	1.2	1.4	1.6	1.8
f(x)	:	0	0.128	0.544	1.296	2.432

(OR)

16. Find  $f'(5)$  and  $f''(5)$  from the following table

x	:	0	2	4	6	8
f(x)	:	4	26	58	112	466

## UNIT - V

17. Derive general Quadrature formula for equidistant ordinates.

(OR)

18. Calculate by Simpson's  $\frac{1}{3}$ rd rule an appropriate value of  $\int_{-3}^3 x^4 dx$  by taking seven distant ordinates. Compare it with the exact value and the value obtained by using the trapezoidal rule.