

P.R. GOVERNMENT COLLEGE, KAKINADA

(An Autonomous College conferred with Potential for Excellence by U.G.C.)

Re - accredited at B (with 2.78 CGPA) by NAAC



BOARD OF STUDIES

2017-2018

STATISTICS

**DEPARTMENT OF
MATHEMATICS & STATISTICS**

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P.R.GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA, E.G.DT.

Department of Statistics

The Board of Studies meeting for **Statistics** subject during the academic year 2017-2018 is conducted at the Dept. of Mathematics & Statistics on **12-04 -2017** at 11.00 AM with Dr.V.Anantha Lakshmi, Lecturer –In-Charge in the chair along with the following members.

Name, designation and address

Signature

1. ChairPerson :

Dr. V.Anantha Lakshmi, Lecturer – In-Charge
Dept. of Mathematics & Statistics
P.R.G.C. (A), Kakinada

2. University Nominee:

Dr.T.C.Ravi Chandra Kumar
Principal
Govt. Degree College, Tuni

3. Members nominated by Academic council of the College:

- a. Dr.V.PapaiahSastry,
Principal
Govt.Degree College, Jaggampet
- b. Dr.K.Madhavi
HOD of Statistics,Govt.Degree Arts College,
Rajahmundry

4. Members from the College:

Faculty members:

- a. Dr.P.Subhashini
Dept. of Mathematics, P.R.G.C.(A), Kakinada
- b. Sri.M.LakshamanaDasu
Dept. of mathematics, P.R.G.C.(A), Kakinada

Student members :

- 1. Siva kumar, III MSCS
- 2. A.Akhiladenswari III MSCS

(DR. Ch.Krishna)

P.R.Government College(Autonomous), Kakinada, A.P.
STRUCTURE OF C.B.C.S. MODEL CURRICULUM IN STATISTICS

Yr.	Course & Theory /	Title	Workload Hrs./week	Credits	Max. Marks		
					Intrnl.	Extrnl	Tot.
I	I Yr. Theory	I Sem: Descriptive Statistics & Probability	4 Hrs	3	40	60	100
		II Sem: Probability & Distributions	4 Hrs	3	40	60	100
	I Yr. Lab	Practical - I	3 Hrs	2	28	72	100
II	II yr. Theory	III Sem: Statistical Methods & Inference	4 Hrs	3	30	70	100
		IV Sem : Testing of Hypothesis	4 Hrs	3	30	70	100
	II Yr. Lab	Practical-II	3 Hrs	2	28	72	100
III	III Theory V Sem.	Core (Advanced) Sampling & Design of Experiments	4 Hrs	3	30	70	100
		Adv. Elective 1: Operations Research-I Adv. Elective 2: Statistical Quality Control	3 Hrs	2	30	70	100
	III Lab	Practical's on Sampling, Design of Experiments & Applied Statistics	3 Hrs	2	28	72	100
	IV Theory VI Sem	Core (Applied) Applied Statistics	4 Hrs	3	30	70	100
		Appl. Elective 1: Operations Research-II Appl. Elective 2: Actuarial Statistics Appl. Elective 3: Econometrics	3 Hrs	2	30	70	100
	IV Lab	Practical's on OR, SQC & Econometrics	3 Hrs	2	28	72	100
	Project	Student Projects	3 months	2	25	75	100
Open to all	COP	Demography	3 Hrs	3	30	70	100

Total number of hours for theory papers and labs in an academic year:

Theory Paper I :120 Hrs (I & II Semesters)	Lab I: 90 Hrs(30 sessions)
Theory Paper II : 120 Hrs (II & IV Semesters)	Lab II: 90 Hrs (30 sessions)
Theory Paper III: 90 Hrs(V & VI Semesters)	Lab III: 90 Hrs (30 sessions)
Theory Paper IV : 90 Hrs(V & VI Semesters)	Lab IV: 90 Hrs (30 sessions)

Statistics Model Blue Print for Question paper and choice for 2nd & 3rd year

S.No.	Type of Questions	To be given in the Question paper			To be answered		
		No. of Questions	Marks allotted to each question	Total marks	No. of Questions	Marks allotted to each question	Total marks
1	<u>SECTION – A</u> Very Short Answer Questions	5	1	5	5	1	5
2	<u>SECTION – B</u> Short Answer Questions	8	5	40	5	5	25
3	<u>SECTION-C</u> Essay Questions	4	10	40	2	10	20
4	<u>SECTION-D</u> Essay Questions	4	10	40	2	10	20
TOTAL		21		125	14		70

Internal Assessment : 15 marks

QUESTION PAPER PATTERN FOR 30 MARKS

S.No	Type of question	No. Of questions given	No. Of questions to be answered	Marks allotted to each question	Total Marks
1	Part-I Very short questions	10	10	1	10
2	Part-II Essay Questions	8	4	5	20
Total					30

Continuous Assessment: 15 Marks

1. Student Seminar : 5 M
2. Assignment : 4 M
3. Viva : 2 M
4. Task : 4 M

P.R.GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc. – Statistics / Semester- I (W.E.F. 2014-2015)

Course: Descriptive STATISTICS

Total Hrs. of Teaching: 52 @ 4 h / Week

Total Credits: 03

Objective: Descriptive statistics is the discipline of quantitatively describing the main features of a collection of information, or the quantitative description itself. Descriptive statistics are distinguished from inferential statistics, in that descriptive statistics aim to summarize a sample, rather than use the data to learn about the population that the sample of data is thought to represent. This generally means that descriptive statistics, unlike inferential statistics, are not developed on the basis of probability theory. Even when a data analysis draws its main conclusions using inferential statistics, descriptive statistics are generally also presented.

Module -I

(12h)

Descriptive Statistics:

Concept of primary and secondary data, methods of collection and editing of primary data-

Designing a questionnaire and a schedule- Sources and editing of secondary data-

Measures of central tendency with simple applications with real life examples.

Module-2

(12h)

Measures Of Dispersion, Skewness & Kurtosis:

Importance of moments, central and non-central moments, and their interrelationships-Sheppard's corrections for moments for grouped data. -Measures of skewness based on quartiles and moments and kurtosis based on moments.

Module-3

(13h)

Probability:

Basic concepts in probability-Mathematical, statistical and axiomatic definitions of probability

-Conditional probability and independence of events- Addition and multiplication theorems for n events-

Boole's inequality and Bayes' theorem- Problems on probability using counting methods and theorems.

Module-4

(15h)

Random Variables:

Definition of random variable-functions of random variables with illustrations- Distribution function

(Uni and Bivariate) and its properties-Transformation of one-dimensional random variable (simple 1-1

functions only)-Notation of bivariate random variable-Joint, marginal and conditional distributions.

Independence of random variables.

List of Text Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi

List of reference Books:

1. Goon AM, Gupta MK, Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt.Ltd., Kolakota.
2. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
3. Sanjay Arora and Bansilal: New Mathematical Statistics SatyaPrakashan, New Delhi.

SEMESTER-I: DESCRIPTIVE STATISTICS**Model blue print for the Question Paper setter****Max. marks: 60****Time: 3 Hrs.**

Unit / Chapter name		Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit - 1				
Descriptive Statistics		2	2	30
Unit - 2				
Dispersion , Skewness & Kurtosis		1	2	25
Unit - 3				
Probability:		2	2	30
Unit - 4				
Random Variables:		1	2	25
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (14)		6	8	-
Total marks allotted to all questions including choice =				110

P.R.Government College (Autonomous), Kakinada
I year B.Sc., Degree Examinations –I Semester
Statistics Paper–IA: DESCRIPTIVE STATISTICS

(Model Paper)
Time: 3 Hrs.

Max. Marks: 60

Section – A

Answer any four of the following questions.

4x5 = 20 M

1. Explain about the primary and secondary Data.
2. Show that the sum of absolute deviation from median is minimum.
3. What is dispersion. Explain mean deviation and standard deviation.
4. What is the chance that leap year selected at random will contain 53 Sundays.
5. A problem in statistics is given to the three students A,B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if all of them solve independently.
6. For a continuous random variable X with p.d.f. $f(x)=3x^2, 0 \leq x \leq 1$. Find a and b such that i) $p(X \leq a) = p(X > a)$ and ii) $p(X > b) = 0.05$

Section – B

Answer any two questions

2x10 = 20 M

7. Distinguish between questionnaire and schedule? Prepare a questioner for conducting a survey of a population profile of a region?
8. Explain measures of central tendency with their relative merits and demerits?
9. Define raw and central moments and establish relationship between them?
10. For the following data compute β_1 and β_2

CI	0-5	5-10	10-15	15-20	20-25	25-30	30-35
F	2	6	8	10	8	6	2

Section – C

Answer any two questions

2x10 = 20 M

11.State and prove additive law of probability of n events.

12. State and prove Baye's theorem probability.

13.A random variable X lies the following probability distributions

X:	0	1	2	3	4	5	6	7	8
P(X):	a	3a	5a	7a	9a	11a	13a	15a	17a

Find the values of a) a b) $p(X < 3)$ c) $p(X \geq 3)$ d) $p(0 < X < 5)$ e) $p(X \leq 7)$

14. Define i) Probability density function

ii) Distribution function.

Suppose that the random variables X takes the values 3,4 and 5 with probabilities $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{1}{3}$ respectively. Obtain distribution function of the random variable X.

P.R.GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc. – Statistics / Semester- II (W.E.F. 2014-2015)

Course: PROBABILITY DISTRIBUTIONS

Total Hrs. of Teaching: 52 @ 4 h / Week

Total Credits: 03

Objective: Distinguish between discrete and continuous random variables, explain the difference between population, parameter, sample, and statistic, determine if a given value represents a population parameter or sample statistic, find probabilities associated with a discrete probability distribution. Compute the mean and variance of a discrete probability distribution. Find probabilities associated with a binomial distribution. find probabilities associated with a normal probability distribution using the standard normal table.

Module -1

(12h)

Mathematical Expectation:

Mathematical expectation of a function of a random variable- Raw and central moments variance and covariance using mathematical expectation with examples.-Addition and multiplication theorems of expectation-Chebyshev's and Cauchy-Schwartz's inequalities and their applications.

Module-2

(15h)

Generating Functions:

Definition of (M.G.F),(C.G.F),(P.G.F),(C.F) And Properties-Statement and applications of weak law of large numbers and central limit theorem for identically and independently distributed (i.i.d) random variables with finite variance.

Module-3

(13h)

Discrete distributions:

Uniform, Bernoulli, Binomial, Poisson, Negative binomial, Geometric and Hyper-Geometric(mean and variance only) distributions- Properties of these distributions and moments up to fourth order and their real life applications-Reproductive property wherever exists-Binomial approximation to Hyper-Geometric, Poisson approximation to Binomial and Negative binomial distributions.

Module-4

(15h)

Continuous distributions:

Rectangular and Normal distributions-Normal distribution as a limiting case of Binomial and Poisson distributions-Exponential, Gamma, Beta of two kinds (mean and variance only)

Cauchy (definition and c.f. only) distributions-Properties of these distributions and moments up to fourth ordertheir real life applications and reproductive productive property wherever exists.

List of Text Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan . Chand&Sons, New Delhi

List of Reference Books:

1. Goon AM, Gupta MK, Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt.Ltd., Kolakota.
2. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.

SEMESTER-II- Paper –IB: PROBABILITY DISTRIBUTIONS
Model blue print for the Question Paper setter

Max. marks: 60

Time : 3 Hrs.

Unit / Chapter name		Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit - 1				
Mathematical Expectation		1	2	25
Unit - 2				
Generating Functions		2	2	30
Unit - 3				
Discrete Distributions		2	2	30
Unit - 4				
Continuous Distributions		1	2	25
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (14)		6	8	-
Total marks allotted to all questions including choice =				110

P.R.Government College (Autonomous), Kakinada
I year B.Sc., Degree Examinations - II Semester
Statistics Paper–IB: PROBABILITY DISTRIBUTIONS

(Model Paper)

Time: 3 Hrs.

Max. Marks: 60

Section – A

Answer any four of the following questions.

4x5 = 20 M

1. Define Mathematical Expectation of a random variable. State its properties?
2. State and prove Chebyshev's inequality.
3. Explain the central limit theorem.
4. Define Poisson Distribution. Obtain its mean and variance?
5. Find m.g.f. of Binomial distribution.
6. Explain the memory less property of geometric distribution.

Section – B

Answer any two questions

2x10 = 20 M

7. State and prove Cauchy Schwartz inequality.
8. State and prove Addition theorem of expectation for n variables
9. Define probability generating function and derive the properties.
10. State Weak law of large numbers and explain its applications

Section – C

Answer any two questions

2x10 = 20 M

11. Define Hyper Geometric distribution, find its mean and variance.
12. Derive the recurrence relation for the moments of Binomial distribution.
13. Define Normal Distribution and find MGF & hence reduce it's mean and variance.
14. Define Gamma distribution, state and prove additive property of gamma distribution.

B.Sc. I Year: Descriptive Statistics & Probability Distributions

Practical - Paper-I

(With Mathematics Combination)

1. Basics of Excel- data entry, editing and saving, establishing and copying a formulae, built in functions in excel, copy and paste and exporting to MS word document.
2. Graphical presentation of data (Histogram, frequency polygon, Ogives) using MS Excel
3. Diagrammatic presentation of data (Bar and Pie) using MS Excel
4. computation of non-central and central moments – Sheppard's corrections for grouped data.
5. Computation of coefficients of Skewness and Kurtosis – Karl Pearson's β_1 and β_2 .
6. Computation of measures of central tendency, dispersion and coefficients of Skew -ness, Kurtosis using MS Excel.
7. Fitting of Binomial distribution – Direct method.
- Fitting of Binomial distribution – Direct method using MS Excel.
8. Fitting of binomial distribution – Recurrence relation Method.
9. Fitting of Poisson distribution – Direct method.
- Fitting of Poisson Distribution – Direct method using MS Excel.
10. Fitting of Poisson distribution - Recurrence relation Method.
11. Fitting of Negative Binomial distribution.
12. Fitting of Geometric distribution.
13. Fitting of Normal distribution – Areas method.
14. Fitting of Normal distribution – Ordinates method.
15. Fitting of Exponential distribution.
16. Fitting of Exponential distribution using MS Excel.

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

Question paper pattern: odd sem

Theory: Five Questions will be given.

The Student has to answer three questions.

3x12=36 M

Record:

10M

Viva:

4M

TOTAL:

50M

Question paper pattern: even sem

Theory: Five Questions will be given.

The Student has to answer three questions.

3x12=36 M

Record:

10M

Viva:

4M

TOTAL:

50M

P.R.GOVERNMENT COLLEGE(A), KAKINADA

II B.Sc. – Statistics/Semester- III(W.E.F. 2015-2016)

Course: STATISTICAL METHODS & INFERENCE

Total Hrs. of Teaching: 52 @ 4 h / Week

Total Credits: 03

Objective: In statistics, **statistical inference** is the process of drawing conclusions from data that are subject to random variation, for example, observational errors or sampling variation.^[1] Initial requirements of such a system of procedures for inference and induction are that the system should produce reasonable answers when applied to well-defined situations and that it should be general enough to be applied across a range of situations. Inferential statistics are used to test hypotheses and make estimations using sample data.

Module-1

(12h)

- a. **Curve fitting:** Principle of least squares, straight line, parabola, power curve, exponential curves, Most Plausible Values
- b. **Attributes:** Analysis of categorical data-Independence, association & partial association of attributes-Coefficient of contingency, coefficient of colligation-Problems on attributes.

Module -2

(14h)

- a. **Correlation:** correlation coefficient & its properties. Bivariate data, scatter diagram, Spearman rank correlation coefficient. Correlation ratio, multiple & partial correlation. Problems on correlation.
- b. **Regression:** regression coefficient & its properties. Regression line of x on y & y on x correlation vs regression, problems on regression & correlation. Problems on regression.

Module-3

(12h)

- a. **Exact sample tests:** Concepts of population, parameter, sample, statistic, sampling, sampling distribution, standard error, sample proportion.
- b. **Chi square test:** Applications & properties.
- c. **T-test:** Applications & properties.
- d. **F-test:** applications & properties.
- e. Relations between chi square, t & F tests, MGF of chi square, t & F tests, inter relation ship between t, F and Chisquare distributions.

Module-4

(14h)

Estimation

- a. **Criteria of good estimator:** Concept of unbiasedness, consistency, efficiency, sufficiency with examples-Problems on binomial, poisson, normal, exponential distributions. Statement & theory of MLE & its properties, Method of moments, Method of variance. Concept of interval estimation, confidence intervals.

List of Text Books:

1. V.K.Kapoor&S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

List of Reference Books:

- 1.Goon AM,GuptaMK,Das Gupta B: Outlines of Statistics,Vol-1,the World Press Pvt,Ltd, Kolkata.
- 2.Hoel P.G.: Introduction to Mathematical Statistics,New Delhi.

Model blue print for the Question Paper setter

STATISTICALMETHODS & INFERENCE

Max. marks: 70

Time : 3 Hrs.

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Module- 1				
Correlation & Regression	1	2	2	31
Module- 2				
Curve fitting Theory of attributes	2	2	2	32
Module- 3				
Exact sample tests	1	2	2	31
Module- 4				
Theory of estimation	1	2	2	31
Any of the above Modules (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	-
Total marks allotted to all questions including choice =				125

P.R.Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations - III Semester
Statistics Paper–IIA: Statistical Methods & Inference

(Model Paper)

Time: 3 Hrs.

Max. Marks: 70

Section –A

Answer all questions

5X1 =5M

1. Define Correlation.
2. What is meant by principle of least squares.
3. Define standard error.
4. Write any two properties of t-test.
5. Define method of moments.

Section – B

5x5 = 25 M

Answer any five of the following questions. **Each question carries five marks.**

6. Define Regression co efficient. State and prove properties of regression co efficient.
7. Show that correlation coefficient is independent of change of origin & scale.
8. Explain principles of least square and fit a straight line
9. Show that $Q = \frac{2Y}{1+Y^2}$
10. Define chisquare test and write it's properties.
11. Explain MGF of t-test.
12. Explain the terms (i) unbiased Estimator (ii) Consistent
13. Find the maximum likelihood estimate for the parameter λ of a poison distribution on the bases of a sample of size n.

Section – C

Answer any two questions

2x10 = 20 M

14. Show that Karl pear son's correlation co efficient is lies between -1 to +1. Ten competitors in a musical test were ranked by the 3 judges A , B and C in the following data.

Rank by A	1	6	5	10	3	2	4	9	7	8
Rank by B	3	5	8	4	7	10	2	1	6	9
Rank by C	6	4	9	8	1	2	3	10	5	7

Using Rank correlation method, discuss which pair of judges has the nearest approach to common likings in music.

15. Estimate the regression lines from the following data

X	16	12	18	4	3	10	5	12
Y	18	88	89	68	78	80	75	83

16. What is meant by Best fit? Explain fitting of an exponential curves of the form

(i) $Y=ab^X$ (ii) $Y=ae^{bX}$

17. Explain the independence of attributes and its criteria.

Section – D

Answer any two questions

2x10 = 20 M

18. Define t – statistics and derive its probability distribution mention the applications of t – distribution.

19. Define χ^2 – distribution state its properties and applications and establish a relationship between F and χ^2 .

20. Explain criteria of good estimator.

21. Establish sufficient conditions for an estimate to be a consistent estimator.

P.R.GOVERNMENT COLLEGE (A), KAKINADA

II B.Sc. –Statistics / Semester- IV (W.E.F. 2015-2016)

Course: TESTING OF HYPOTHESIS

Total Hrs. of Teaching: 52 @ 4 h / Week

Total Credits: 03

Objective: After studying this semester we know how to able to define null and alternate hypothesis, to calculate probabilities using an appropriate model to test a null hypothesis, to test mean based on a sample, understand when to use a one or two tailed tests.

Module -1

(12h)

- a. **Concepts of statistical hypothesis:** Null & alternate hypothesis, procedure for testing of hypothesis, critical region, two types of errors, one & two tailed tests, level of significance, power of a test.
- b. **Large sample tests:** Test for single mean
Test for difference of means
Test for single proportion
Test for difference of proportions
Test for difference of standard deviations
Problems on large sample tests.

Module-2

(8h)

- a. Randomized tests
- b. Non Randomized tests.
- c. Neman Pearson's Lemma theorem in randomized tests
- d. Examples in case of binomial, poisson, exponential, normal distributions.

Module-3

(16h)

Small Sample Tests

- a. **Chi square test:** chisquare test for variance, goodness of fit, independence of attributes & Problems based on chisquare test.
- b. **T-test:** test for single mean, test for difference of means, paired t -test ,test for standard deviation, test for sample correlation coefficient & problems.
- c. **F-test:** Test for equality of variance & problems.

Module-4

(16h)

Non Parametric Tests

- a. **Non Parametric tests:** comparison with parametric tests, advantages & dis advantages of NP tests, assumptions of NP tests.
- b. **Sign test:** one sample sign test, two sample sign test procedures & problems.
- c. Mann-Whitney wilcoxon U test: procedure & problem
- d. **Run test:** procedure & problem
- e. Wilcoxon Rank test for one & two simple tests: procedure & problem.

List of Text Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi

List of Reference Books:

2. Goon AM, Gupta MK, Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt.Ltd., Kolakota.

3. Hoel P.G: Introduction to mathematical statistics, Asia Publishing hous.

Paper –II B: TESTING OF HYPOTHESIS

Model blue print for the Question Paper setter

Max. marks: 70

Time : 3 Hrs.

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Module - 1				
Concepts of Statistical Hypothesis & Large sample tests	2	2	2	32
Module - 2				
Randomized & Non randomized tests	1	2	2	31
Module - 3				
Small sample tests	1	2	2	31
Module - 4				
Non Parametric tests	1	2	2	31
Any of the above Modules (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	-
Total marks allotted to all questions including choice =				125

P.R.Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations-IV Semester
Statistics Paper –II B: Testing of Hypothesis
(Model Paper)

Time: 3 Hrs.

Max. Marks: 70

Section –A

5X1 = 5 M

Answer all questions

1. Define null hypothesis.
2. Write the statement of NP Lemma.
3. Define f-test.
4. Define independence of attributes.
5. Define non parametric tests.

Section – B

5x5 = 25 M

Answer any five of the following questions. Each question carries five marks.

6. Define the following.
a) Null Hypothesis b) Alternative Hypothesis
7. What are the steps involved in solving testing of Hypothesis problem
8. Explain about binomial distribution for randomized tests.
9. Explain non randomized tests.
10. Explain the t-test for single mean.
11. Explain the test for difference of proportions.
12. What are the advantages and disadvantages of Non Parametric methods.
13. Explain Median Test.

Section – C

Answer any two questions

2X10=20M

14. Two random samples gave the following results:

Sample	size	Sample mean	Sum Squares of Deviations from the Mean
1	10	15	90
2	12	14	108

Test where the samples come from the same normal population at 5% level of significance.

15. Explain procedure for testing of hypothesis and also explain large sample test for difference of standard deviation.
16. Distinguish between randomized and non randomized tests.
17. State and prove Neymann Pearsons Lemma

Section – D

Answer any two questions

2X10=20M

18. Explain (i) Chisquare test for goodness of fit.

(ii) Chisquare test for independence of attributes.

19. Explain the large sample test for testing the difference of two means. Random samples drawn from two countries gave the following data relating to the heights of adult males.

	Country A	Country B
Mean Height (in inches)	67.42	67.25
S.D(in inches)	2.58	2.50
No.of samples	1000	1200
Is the difference between means significant at 1% los.		

20. Explain Mann Whitney Wilcoxon U test.

21. Discuss about Wilcoxon Signed Rank test for one sample and two sample tests.

B.Sc. II Year: Statistics Practical-II (With Mathematics Combination)

90 hrs

(3 hrs/ week)

1. Fitting of straight line and parabola by the method of least squares.
2. Fitting of straight line and parabola by the method of least squares using MS Excel.
3. Fitting of power curves of the type $y = a x^b$, $y = a b^x$ and $y = a e^{bx}$ by the method of least squares.
4. Fitting of power curves of the type $y = a x^b$, $y = a b^x$ and $y = a e^{bx}$ by the method of least squares using MS Excel.
5. Computation of correlation coefficient and regression lines for ungrouped data.
6. Computation of correlation coefficient, forming regression lines for ungrouped data.
7. Computation of correlation coefficient, forming regression lines for grouped data.
8. Computation of correlation coefficient, forming regression lines using MS Excel.
9. Computation of multiple and partial correlation coefficients.
10. Computation of multiple and partial correlation coefficients using MS Excel.
11. Computation of correlation ratio.
12. Large sample tests for mean(s), proportion(s), Standard deviation(s) and correlation coefficient.
13. Small sample tests for single mean and difference of means and correlation coefficient.
14. Paired t-test.
15. Small sample tests for mean(s), paired t-test and correlation coefficient using MS Excel.
16. Small sample test for single and difference of variances.
17. Small sample test for single and difference of variances using MS Excel.
18. χ^2 – test for goodness of fit and independence of attributes.
19. χ^2 – test for goodness of fit and independence of attributes using MS Excel.
20. Nonparametric tests for single and related samples (sign test and Wilcoxon signed rank test) and one sample runs test.
21. Nonparametric tests for two independent samples (Median test, Wilcoxon Mann Whitney - U test, Wald - Wolfowitz's runs test)

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MSWord for writing inferences.

Question paper pattern. odd sem

Theory: Five Questions will be given.

The Student has to answer three questions.	3x12=36 M
Record:	10M
Viva:	4M
TOTAL:	50M

Question paper pattern: even sem

Theory: Five Questions will be given.

The Student has to answer three questions.	3x12=36 M
Record:	10M
Viva:	4M
TOTAL:	50M

P.R.GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc. – Statistics / Semester- V (W.E.F. 2016-2017)
Course: sampling & design of experiments

Total Hrs. of Teaching: 52 @ 4 h / Week

Total Credits: 03

Objective: In the design of experiments, the experimenter is often interested in the effect of some process or intervention (the "treatment") on some objects (the "experimental units"), which may be people, parts of people, groups of people, plants, animals, etc. Design of experiments is thus a discipline that has very broad application across all the natural and social sciences and engineering.

Module -1

Sampling

(14h)

- a. Concepts of sampling
- b. Principle steps in sample survey
- c. Sampling errors
- d. Non sampling errors
- e. Types of sampling ,Simple random sampling with replacement(SRSWR)
- f. Simple random sampling without replacement(SRSWOR), expected value for population mean, sample variance, variance of sample mean in SRSWR and SRSWOR

Module - 2

(12h)

- a. Stratified random sampling, Proportional and Optimum Allocation, variance of sample mean in both allocations
- b. Systematic random sampling
- c. Advantages & disadvantages of systematic & stratified random sampling

Module - 3

(14h)

Design of Experiments:

- a. One way classification. (mathematical model, statistical model & ANOVA table)
- b. Two way classification (mathematical model, statistical model & ANOVA table)
- c. Principles of design of experiments- randomization replication local control

Module - 4

(12h)

- a. Completely randomized design(mathematical model, statistical model & ANOVA table)
- b. Randomized block design(mathematical model, statistical model & ANOVA table)
- c. Latin square design(mathematical model, statistical model & ANOVA table)
- d. Advantages &disadvantages of CRD,RBD &LSD

List of text books:

- 1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand

List of reference books

- 1.Parimal Mukhopadhyay : Applied Statistics .New Central Book agency.
- 2. B.L.Agarwal: Basic Statistics.New Age publications.
- 3.S.C.Gupta : Statistical Methods. Sultan Chand and Sons.
- 4.Pratirupa Sidhanthamulu – Telugu Academy.

Model blue print for the Question Paper setter**Sampling & Design of Experiments****Max. marks: 70****Time : 3 Hrs.**

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit - 1				
sampling	2	2	2	32
Unit - 2				
Types of sampling	1	2	2	31
Unit - 3				
Design of Experiments	1	2	2	31
Unit - 4				
Applications on design of experiments	1	2	2	31
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	-
Total marks allotted to all questions including choice =				125

P.R.Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations- V Semester
Statistics Paper III A: Sampling & Design of Experiments
(Model paper)

Time: 3 Hrs.

Max. Marks: 70

Section – A

5x1=5M

Answer all questions

1. Define sampling unit.
2. What is parameter.
3. Define mixed sampling.
4. How many types are there in principle of design of experiments.
5. Define CRD.

Section – B

5x5 = 25 M

Answer any five of the following questions. Each question carries five marks.

6. What are the errors involved in sample surveys.
7. State briefly the advantages of sampling over complete enumeration.
8. Explain the method of stratified random sampling.
9. Explain subjective sampling & mixed sampling.
10. List out the basic assumptions involved in ANOVA technique.
11. Write a note on principle of “Randomization”.
12. Write the advantages of C.R.D.
13. What is the efficiency of L.S.D over R.B.D.

Section – C

Answer any two questions.

2X10=20M

14. What are the main steps involved in a sample survey. Discuss them briefly.
15. Explain SRSWR and SRSWOR.
16. In simple random sampling without replacement prove that sample mean square is an unbiased estimation of population mean square i.e. $E(s^2) = s^2$
17. Explain the method of systematic sampling. Discuss the merits and demerits of systematic sampling.

Section – D

Answer any two questions.

2X10=20M

18. What is meant by two way classification. Give layout and analysis for a two way classification.
19. Explain about ANOVA Technique. Give layout and analysis for a one way classification.
20. What is meant by Randomized Block Design. Give the layout and analysis of a Randomized Block Design. Discuss the advantages and disadvantages of Randomized Block Design.
21. What is Latin Square Design. Give the layout and analysis of a Latin Square Design. Discuss the advantages and disadvantages of Latin Square Design.

P.R.Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations VI Semester
Statistics Paper III: Applied Statistics
(Model paper)

Time: 3 Hrs.

Max. Marks: 70

Section-A

5x1=5M

Answer all questions.

1. Define time series.
2. What is meant by quantity index.
3. Write any two uses of index numbers.
4. Define vital statistics.
5. Define equilibrium price.

Section – B

5x5 = 25 M

Answer any five of the following questions. Each question carries five marks.

6. Explain the method of moving averages in time series data.
7. Explain cyclical component of a time series.
8. Explain weighted price Index.
9. What is meant by base shifting.
10. Write the uses of life table.
11. Explain about Net Reproduction Rate.
12. Describe the method for estimating the elasticity of demand for time series data.
13. Write about price elasticity of demand.

Section – C

2x10 = 20 M

Answer any two questions

14. What are the measurement of seasonal variation. Discuss briefly about the difference types of measurement of seasonal variation.
15. Describe the methods of Trend. Discuss briefly about the measures different types of Trend.
16. What are the Problems or steps involved in the construction of Index Numbers?
17. Explain about the Criteria for Good Index Number?

Section – D

2x10 = 20 M

Answer any two questions

18. Explain (i) General Fertility Rate. (ii) Specific Fertility Rate. (iii) Total Fertility Rate.
19. State the meanings of various columns of a life table and mention the construction of a life table. Explain the relationship between different columns.
20. Describe demand and supply curves and the uses of these curves.
21. Explain Pareto's law of income distribution.

Paper –III -VI Semester: Applied Statistics

Model blue print for the Question Paper setter

Max. marks: 70

Time : 3 Hrs.

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit – 1				
Time Series	1	2	2	31
Unit – 2				
Index Numbers	2	2	2	32
Unit – 3				
Vital Statistics	1	2	2	31
Unit – 4				
Demand Analysis	1	2	2	31
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	-
Total marks allotted to all questions including choice =				125

III Year: Statistics Practical Paper-III (With Mathematics Combination)

Sampling Techniques

Estimation of population mean, population total and variance of these estimates by

1. Simple random sampling with and without replacement. Comparison between SRSWR and SRSWOR.
2. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.
3. Systematic sampling with $N=nk$. Comparison of systematic sampling with Stratified and SRSWOR.

Design of Experiments:

4. ANOVA – one – way classification with equal number of observations
5. ANOVA - one–way classification with equal number of observations using MS Excel.
6. ANOVA Two-way classification with equal number of observations.
7. ANOVA Two-way classification with equal number of observations using MS Excel
8. Analysis of CRD. Analysis of RBD with and without missing observation
9. Analysis of CRD. Analysis of RBD with and without missing observation using MS Excel
10. Analysis of LSD with and without missing observation
11. Analysis of LSD with and without missing observation using MS Excel.
12. Comparison of relative efficiency of CRD with RBD and comparison of relative efficiencies of LSD with RBD and CRD.

Time Series Analysis:

13. Measurement of trend by methods of Least squares and moving averages
14. Measurement of trend by methods of Least squares and moving averages using MS Excel.
15. Determination of seasonal indices by methods of Ratio to moving averages, Ratio to trend and Link relatives.
16. Determination of seasonal indices by methods of Ratio to moving averages, Ratio to trend and Link relatives using MS Excel.

Index Numbers:

17. Computation of simple and all weighted index numbers.
18. Computation of reversal tests.
19. Construction of cost of living index number and wholesale index number.
20. Construction of fixed base and chain base index numbers.
21. Base shifting, Splicing and Deflation.
- 21 Computation of all weighted indices, cost of living index number, Base shifting, splicing and deflation using MS Excel.

Vital Statistics:

22. Computation of various Mortality rates, Fertility rates and Reproduction rates.
23. Construction of Life Tables and Abridged life tables.
24. Construction of various rates, life tables and abridged life tables using MS

Excel

Demand Analysis:

25. Construction of Lorenz curve.
26. Fitting of Pareto law to an income data.
27. Construction of Lorenz curve using MS Excel.

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MSWord for writing inferences.

Question paper pattern. odd sem

Theory: Five Questions will be given.

The Student has to answer three questions.

3x12=36 M

Record:

10M

Viva:

4M

TOTAL:

50M

Question paper pattern: even sem

Theory: Five Questions will be given.

The Student has to answer three questions.

3x12=36 M

Record:

10M

Viva:

4M

TOTAL:

50M

P.R.GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc. – statistics / Semester- VI (W.E.F. 2016-2017)
PAPER-III

Course: Applied Statistics (Total Hours of Teaching: 45 @ 3 h / Week)

Objectives: Statistics is an inductive science in which information is extracted from sample data in order to draw inferences. This most often involves planning experiments to ensure that valid answers to questions are obtained from the sample. Statistics is a subject that deals with the collection and analysis of data and affects most aspects of modern life.

Module-1 (11h)

Time Series

- a. Components of Time Series
- b. Importance of Time Series
- c. Measures of Trend
- d. Measures of seasonal trend
- e. Uses of Time Series
- f. Models of Time Series

Module -2 (12h)

Index Numbers

- a. Steps involved in the construction of index numbers.
- b. Quantity index number
- c. Weighted & Un Weighted index numbers
- d. Criteria of good index number
- e. Cost of living index number
- f. Base Shifting, Splicing, Deflating of index numbers
- g. Uses, importance of index numbers

Module - 3 (10h)

Vital Statistics

- a. Collection of Vital Statistics
- b. Measures of Mortality
- c. Measures of Fertility.
- d. Measures of Population Growth.
- e. Construction & Uses of life Table.

Module – 4 (12h)

Demand Analysis

- a. Demand & Supply-Laws of demand & supply-Price Elasticity's of Demand & Supply.
- b. Time Series data
- c. Family budget data
- d. Leonitef's Method for demand & Supply
- e. Pareto's law of income distribution

Official Statistics

Functions and organization of CSO and NSSO. Agricultural Statistics, National Income and it's computation.

List of Text Books:

1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand

List of reference books:

1. Parimal Mukhopadhyay : Applied Statistics . New Central Book agency.
2. Daroga Singh and Chowdhary: Theory and Analysis of Sample survey designs. Wiley Eastern.
3. M.R.Saluja : Indian Official Statistics. ISI publications.
4. B.L.Agarwal: Basic Statistics.New Age publications.
5. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.
6. Prathirupa Sidhanthamulu – Telugu Academy.
7. Prayoga Rachana and Visleshana – Telugu Academy.

P.R.Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations- V Semester
Statistics IV B: Statistical Quality Control & RELIABILITY (Model paper)

Time: 3 Hrs.

Max. Marks: 70

Section-A

Answer all questions:

5x1=5M

1. Define process control.
2. Draw the chart for control limits.
3. Define six sigma.
4. What is AQL.
5. Define reliability.

Section – B

5x5 = 25 M

Answer any five of the following questions. Each question carries five marks.

6. Explain the terms of assignable and chance causes.
7. How do you construct the p-chart.
8. What is meant by natural tolerance?
9. Explain process capability index.
10. Explain process control and product control.
11. Explain AQL and LTPD.
12. Explain reliability function and it's estimation.
13. Derive maximum likelihood estimate of exponential function.

Section – C

2x10 = 20 M

Answer any two questions.

14. What are control charts. How do you construct x and R- charts.
15. Explain the control charts for attributes. How are they useful.
16. What are the uses of statistical quality control. Explain the statistical basis of control chart analysis.
17. Define Six sigma and explain it's importance in statistical quality control.

Section – D

2x10 = 20 M

Answer any two questions.

18. What do you understand by accepting sampling procedure. State it's uses giving illustration.
19. Explain double sampling plan for attributes.
20. Explain importance of exponential distribution as a failure model. State and prove memory less property of exponential distribution.
21. Explain series and parallel systems. Derive the reliability of series system.

Paper –IV B: Statistical Quality Control & Reliability

Model blue print for the Question Paper setter

Max. marks: 70

Time : 3 Hrs.

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit - 1				
Statistical Quality Control-I	2	2	2	32
Unit - 2				
Statistical Quality Control-II	1	2	2	31
Unit - 3				
Acceptance Sampling	1	2	2	31
Unit - 4				
Reliability	1	2	2	31
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	-
Total marks allotted to all questions including choice =				125

P.R.GOVERNMENT COLLEGE(A), KAKINADA
III B.Sc. – Statistics/ Semester- V / Paper-IV B Syllabus
Paper Title: Statistical Quality Control & Reliability

(Total Hours of Teaching: 48 @ 3 h / Week)

Objective: The main objective of SQC is to achieve quality in production and service organizations, through the use of adequate statistical techniques.

Module-1 Statistical Quality Control-I (12h)

1. Importance of SQC in industry
2. Control limits & control charts
3. Statistical basis for Shewart control charts
4. Interpretation of control charts
5. Natural tolerance limits

Module-2 Statistical Quality control -II (10h)

1. Control charts for attributes
2. Control charts for variables
3. Process capability index
4. Specification limits
5. Importance of Six Sigma

Module-3 Acceptance sampling (12h)

1. Producer risk & consumer risk
2. Concept of AQL & LTPD
3. Single sample plan for attribute using binomial distribution
4. Double sample plan for attribute using binomial distribution
5. OC curves & ASN curves.

Module-4 Reliability (14h)

1. Introduction to reliability
2. Hazard function & MLE of Hazard function
3. Memory less property of exponential distribution
4. Reliability function & its estimation
5. Concepts of censoring & truncation
6. Types of Systems in reliability
7. Series & Parallel configuration

P.R.Government College (Autonomous), Kakinada

Paper Title: Econometrics

VI Semester paper IV-C

(Total Hours of Teaching: 48 @ 3 h / Week)

Objective: On successful completion of the course the students should have understood econometric Model, estimation and testing of parameters, forecasting and verification of economic theory and application of models in planning.

Module -1 (14h)

Definition-Scope
Objectives of Econometrics
Limitations-Divisions of Econometrics

Module - 2 (10h)

Single equation model two variable case
Reasons for introducing error term in the model
least square method of estimation and testing of parameters of the models
Estimation of error variance
Simple problems.

Module - 3 (14h)

General linear model
Assumptions
Least square method of estimation and testing of the parameters of the models
problems under failure of assumptions.

Module - 4 (14h)

Multicollinearity
Effects of multicollinearity
detecting multicollinearity
Remedies
Autocorrelation-sources of autocorrelation
Dubin-watson test-Dummy variables (concept only)
Specification errors.

List of reference books:

- 1.Ecnometrics Basic and applied by Aaron C Johnson Jr,Marvin B Johnson and Rueben C Buse (Maxwell Maxmillan Intl editions)
2. Ecnometric methods by Johnston. J (McGraw Hill Intl students' editions)
3. Theory of Ecnometrics by Koutsoyannis. A (Palgrave publications Ltd)

Paper Title-Econometrics-IV(C)

Model blue print for the Question Paper setter

Max. marks :70

Time : 3 Hrs.

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit - 1				
Module-I	2	2	2	32
Unit - 2				
Module-II	1	2	2	31
Unit - 3				
Module-III	1	2	2	31
Unit - 4				
Module-IV	1	2	2	31
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	-
Total marks allotted to all questions including choice =				125

P.R.Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations V Semester
Statistics Paper IV A: Operations Research-I

Time: 3 Hrs.

Max. Marks: 70

Objective: Operations research, or operational research in British usage, is a discipline that deals with the application of advanced analytical methods to help make better decisions. It is often considered to be a sub-field of mathematics. Employing techniques from other mathematical sciences, such as mathematical modeling, statistical analysis, and mathematical optimization, operations research arrives at optimal or near-optimal solutions to complex decision-making problems. Operations research is often concerned with determining the maximum (of profit, performance, or yield) or minimum (of loss, risk, or cost) of some real-world objective. Originating in military efforts before World War II, its techniques have grown to concern problems in a variety of industries

Module -1

Introduction to Operations Research

(10h)

Meaning and scope of OR.
Definition of general LPP.
Formulation of LPP.
Solution of LPP by graphical method.
Fundamental theorem of LPP

Module - 2

Linear Programming Problem

(15h)

Simplex Method
Big -M /Penalty method
two-phase simplex methods.
Concept of degeneracy and resolving it.

Module - 3

Duality and Dual Simplex

(15h)

Concept of duality
Duality as LPP.
Dual Primal relationship.
Statement of Fundamental theorem of duality.
Dual simplex method.

Module - 4

Networking Models

(14h)

PERT
CPM

List of text books:

Operation Research by S.D.Sharma.

P.R.Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations- VI Semester
Statistics Paper IV A: Operations Research-II

Time: 3 Hrs.

Max. Marks: 70

Objective: The central objective of operations research is optimization, i.e., "to do things best under the given circumstances." This general concept has great many applications, for instance, in agricultural planning, biotechnology, data analysis, distribution of goods and resources, emergency and rescue operations, engineering systems design, environmental management, financial planning, health care management, inventory control, manpower and resource allocation, manufacturing of goods, military operations, production process control, risk management, sequencing and scheduling of tasks, telecommunications, and traffic control.

Module -1

Transportation Problem

(12h)

Definition of transportation problem,
TPP as a special case of LPP,
Feasible solutions by NWCR, MM, VAM
Optimal solution through MODI
Unbalanced transportation problem.
Degeneracy in TP and resolving it.

Module-2

(14h)

Assignment Problem

Formulation and description of Balanced Assignment problem.
Unbalanced assignment problem,
Traveling salesman problem.
Optimal solution using Hungarian method.

Module –3

(10h)

sequencing

Problem of Sequencing.
Optimal sequence of N jobs on two and three machines without passing.

Module –4

(14h)

Game Theory

Two Person Zero Sum Game
Saddle Point
Dominance property
Graphical Solution for $m \times 2$, $2 \times n$

List of text books:

Operation Research by S.D.Sharma.

P.R.Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations-VI Semester
Statistics IV A: operations research (Model paper)

Time: 3 Hrs.

Max. Marks: 70

Section –A

5X1 = 5 M

Answer all questions.

1. Define unbalanced assignment problem.
2. Define optimal sequence.
3. Define mixed strategies.
4. Define payoff matrix.
5. Define transportation.

Section – B

5x5 = 25 M

Answer any five of the following questions. Each question carries five marks.

6. Explain the procedure of travelling sales man problem.
7. Explain the procedure of unbalanced assignment problem.
8. Define idle time & total elapsed time.
9. Explain two machines and n jobs for the sequencing problem.
10. Explain the graphical method to solve rectangular game.
11. Give matrix method to solve mxn games.
12. What is unbalanced transportation problem.
13. What is degeneracy in transportation problem.

Section – C

2x10 = 20 M

Answer any two questions.

14. Define a transportation problem and explain the problem of degeneracy. Explain a method of resolving it.

15. Describe the MODI method to solve a transportation problem. Obtain an optimum solution to the following transportation problem.

D	E	F	availability
5	1	7	10
6	4	6	30
3	2	1	15
75	20	50	

16. Explain the procedure of Hungarian Method.

17. Solve the following assignment problem

Man/ job	A	B	C	D
1	5	3	2	8
2	7	9	2	6
3	6	4	5	7
4	5	7	7	8

Section – D

2x10 = 20 M

Answer any two questions.

18. Write the Procedure to determine the sequence for performing the jobs to minimize total elapsed time T.

19. Determine the optimal sequence of jobs that minimizes total 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
Machine M1:	3	8	7	4	9	8	7
Machine M2:	4	3	2	5	1	4	3
Machine M3:	6	7	5	11	5	6	12

20. Explain the minimax criterion as applied to the theory of games.

21. Solve the game whose payoff matrix is given by:

		Player B		
		-1	2	1
Player A	1	-1	2	1
	2	1	-2	2
	3	3	4	-3

Paper –IV A: Operations Research-II

Model blue print for the Question Paper setter

Max. marks:70

Time : 3 Hrs

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit - 1				
Transportation	1	2	2	31
Unit - 2				
Assignment	1	2	2	31
Unit - 3				
Sequencing	2	2	2	32
Unit - 4				
Game Theory	1	2	2	31
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	
Total marks allotted to all questions including choice =				125

P.R.Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations- V Semester
Statistics IV A: Operations Research (Model paper)

Time: 3 Hrs.

Max. Marks: 70

Section –A

5X1 = 5 M

Answer all questions.

1. Define slack variable.
2. What are the models in OR.
3. Define networking.
4. What is unbalanced assignment problem.
5. Define cpm.

Section – B

5x5 = 25 M

Answer any five of the following questions

6. Name the types of models in O.R. modeling.
7. Give the general description of LPP and define types of it's solution.
8. Convert the following primal L.P.P. to Dual L.P.P.
$$\text{Max } Z = 9x_1 + 11x_2 + 13x_3;$$
$$\text{S.T.C } 2x_1 + 3x_2 + 4x_3 < 10$$
$$3x_1 + x_2 + 2x_3 > 15$$
$$5x_1 + 4x_2 + x_3 = 20 \text{ and } x_1, x_2, x_3 > 0$$
9. Explain dual simplex method.
10. Write about cpm.
11. Explain networking.
12. Explain the procedure for big M method.
13. State and Prove fundamental theorem for dual LPP

Section – C

Answer any two question

2x10 = 20 M

14. Describe the nature and scope of Operation Research.
15. What are Or models. What are their characteristics.
16. Explain the procedure for graphical method.
17. solve the following LPP by simplex method.
$$\text{Max. } Z = 5x_1 + 10x_2 + 8x_3$$

Sub. To constraints

$$3x_1 + 5x_2 + 2x_3 < 60$$

$$4x_1 + 4x_2 + 4x_3 < 72$$

$$2x_1 + 4x_2 + 5x_3 < 100$$

$$x_1, x_2, x_3 > 0$$

Section – D

Answer any two questions.

2x10 = 20 M

18. Explain the procedure for two phase method.
19. State and prove dual of a dual is primal.

20. Explain the procedure for PERT.

21. Activity: 1-2 1-3 2-3 2-5 3-4 3-6 4-5 4-6 5-6 6-7

Duration: 15 15 3 5 8 12 1 14 3 14

Find CPM and compute total float.

Paper –IV A: Operations Research-I

Model blue print for the Question Paper setter

Max. marks = 70

Time : 3 Hrs.

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit - 1				
Introduction to OR	2	2	2	32
Unit - 2				
LPP	1	2	2	31
Unit - 3				
Duality & Dual simplex	1	2	2	31
Unit - 4				
Networking	1	2	2	31
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	
Total marks allotted to all questions including choice =				125

B.Sc. III Year: Statistics Syllabus Practical Paper –IV (Elective – I&II)

Statistical Quality Control

1. Construction of mean, range and standard deviation charts.
2. Construction of mean, range and standard deviation charts using MS Excel
3. Construction of p, np and c- charts with fixed and varying sample sizes.
4. Construction of p, np and c- charts with fixed and varying sample sizes using MS Excel.
5. Designing of Single sampling plan and Double sampling plan for attributes and construction of their OC and ASN curves
6. Designing of Single sampling plan and Double sampling plan for attributes and construction of their OC and ASN curves using MS Excel.

Reliability

7. Computation of reliability for series, parallel and k out of n systems.
8. Computation of reliability for series, parallel and k out of n systems using MS Excel.

Operations Research

9. Formulation and graphical solutions of LPP (using different inequality type constraints)
10. Solution of LPP by simplex method.
11. Solution of LPP by simplex method using.
12. Solution of an LPP using Big-M and two phase simplex methods
13. Solution of an LPP using Big-M method and two phase simplex method .
14. Solution of an LPP using principal of duality and dual simplex methods.
15. Solution of an LPP using principal of duality and dual simplex methods.
16. Formulation and solution of transportation problem using North-West corner rule, Matrix minimum methods and VAM and to test their optimality.
15. Formulation and solution of transportation problem using North-West corner rule, Matrix minimum methods and VAM and to test their optimality.
18. Optimum solution to balanced and unbalanced transportation problems by MODI method (both maximization and minimization cases).
19. Formulation and solution of Assignment problem using Hungarian method (both

maximization and minimization cases),

20. Formulation and solution of Assignment problem using Hungarian method (both maximization and minimization cases.

21. Solution of unbalanced Assignment problem.

22. Solution of traveling salesman problem.

23. Solution of sequencing problem—processing of n jobs through two machines and processing of n jobs through three machines.

24. Solution of PERT & CPM.

25. Solution of graphical method in game theory

26. Solution of dominance rule in game theory.

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MSWord for writing inferences.

Question paper pattern. odd sem

Theory: Five Questions will be given.

The Student has to answer three questions. **3x12=36 M**

Record: **10M**

Viva: **4M**

TOTAL: **50M**

Question paper pattern: even sem

Theory: Five Questions will be given.

The Student has to answer three questions. **3x12=36 M**

Record: **10M**

Viva: **4M**

TOTAL: **50M**

P.R.Government College (Autonomous), Kakinada
Degree Examinations
Statistics Paper Add on Course: Demography

Time: 3 Hrs.

Max. Marks: 70

Objective: To achieve knowledge about the size, composition organization and distribution of the population .To describe the past evolution present distribution and future changes in the population of an area. To enquire the trends of population and it's relationships with the different aspects of social organization in an area. To protect the future demographic evolution and it's probable consequences.

Module -1

(14h)

Scope and content of population census in India- Population composition, dependency ratio.
Brief coverage & content errors in demographic data & adjustment of age data-
Use of Whipple, Myer Blended index-
Chandrasekar-Deming model to check completeness of registration data.

Module - 2

(14h)

Measures of Mortality-Stochastic models for reproduction
Distribution of time to first birth, inter-live, birth intervals & no. of births.
Measures of Fertility-Construction of abridged life tables
Relation between functions of life tables-Distribution of life table functions

Module - 3

(10h)

Stable and Quasi-stable population- Intrinsic growth rate
Methods for population projection
Use of Leslie Matrix

Module – 4

(14h)

Models for population growth-Fitting to population data
Linear, Exponential, Logarithmic, Modified logarithmic , Gompertz & logistic curves.
Stochastic models for population growth.

List of text books:

1. Techniques of Demographic analysis, Himalaya publishers
2. Applied stochastic processes, New age international publishers ltd
3. Basic demographic techniques & applications age publications
4. Principles of population studies, Himalaya publishing house

Reference books:

1. Demographic analysis, George Alley & Vaion
2. Introduction to stochastic process in biostatistics- John Willey
3. Applied Mathematical Demography-springer Verlag

Add on Course: Demography

Model blue print for the Question Paper setter

Max. marks = 70

Time : 3 Hrs.

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit - 1				
Introduction to Demography	2	2	2	32
Unit - 2				
Elements of population change	1	2	2	31
Unit - 3				
Population Composition	1	2	2	31
Unit - 4				
Demography on current social concerns	1	2	2	31
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	
Total marks allotted to all questions including choice =				125

P.R.Government College (Autonomous), Kakinada
Degree Examinations

Statistics Add on Course: Demography (Model paper)

Time: 3 Hrs.

Max. Marks: 70

Section – A

5X1 = 5 M

Answer all questions.

1. Adjustment of age data.
2. Whipple index.
3. Migration.
4. Entries of life table.
5. Logistic curve.

Section – B

5x5 = 25 M

Answer any five of the following questions. Each question carries five marks.

6. Explain Myer's Blended index.
7. Write about content errors.
8. Explain four closed birth intervals.
9. Write about William's Brass Model.
10. What are the uses of life table.
11. What is stationary population.
12. What are the methods for population growth.
13. Explain birth, death & migration process.

Section – C

2x10 = 20 M

Answer any two questions.

14. Explain Chandrasekhar-Deming formula and give its use.
15. Explain the use of Whipple's index in estimating age heaping.
16. Describe the various measures of fertility.
17. Give the Reed-Merrells method for the construction of an abridged life table.

Section – D

2x10 = 20 M

Answer any two questions.

18. Describe the methods for population projection.
19. What are the uses of Leslie Matrix.
20. Describe momentum of population growth.
21. Explain logistic model in measuring population growth and how is it preferable over Gompertz model.

P.R. Government College (Autonomous), Kakinada
Paper Title: Actuarial Statistics
VI Semester paper IV-B

(Total Hours of Teaching: 60@ 3 h / Week)

Module -1 **(15h)**

Utility theory, insurance and utility theory, models for individuals claims and their sums, survival function, curate future lifetime, force of mortality.
Life table and it's relation with survival function examples, assumptions of fractional ages, some analytical laws of mortality select and ultimate tables.

Module - 2 **(15h)**

Multiple life functions, joint life and last survivor status, insurance and annuity benefits through multiple life functions, evaluation for special mortality laws.
Multiple decrement models, deterministic and random survivorship groups, associated single decrement tables, central rates of multiple decrement, net single premiums and their numerical evaluations.

Module - 3 **(15h)**

Elements of compound interest (nominal and effective rate of interest)
Life annuities: Single payment, continuous life annuities, discrete life annuities, life annuities with monthly payments, communication functions, varying annuities-due recursions and complete annuities-immediate and apportionable annuities-due.

Module - 4 **(15h)**

Net premiums: Continuous and discrete premiums, true monthly payment premiums, apportionate premiums, communication functions, and accumulation type benefits.
Net premium reserves: continuous and discrete net premium reserve, reserves on a semi continuous basis, reserves based on true monthly premiums, reserves on an apportionable or accounted continuous basis reserves at fractional durations.

Paper Title-ACTURIAL STATISTICS IV(B)

Model blue print for the Question Paper setter

Max. marks : 70

Time : 3 Hrs.

Unit / Chapter name	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
Unit - 1				
Module-I	2	2	2	32
Unit - 2				
Module-II	1	2	2	31
Unit - 3				
Module-III	1	2	2	31
Unit - 4				
Module-IV	1	2	2	31
Any of the above Units (i.e., 1-4)				
-				
Total No. of Questions including choice (21)	5	8	8	-
Total marks allotted to all questions including choice =				125

P.R. Government College (Autonomous), Kakinada

Paper Title: Actuarial Statistics

VI Semester paper IV-B

MODEL PAPER

Time : 3 Hrs.

Max. Marks: 70M

Section –A

5X1 = 5 M

Answer all questions.

1. Utility theory.
2. Life table.
3. Net single premium.
4. Single payment.
5. Continuous premium.

Section – B

5x5 = 25 M

Answer any five of the following questions. Each question carries five marks.

6. Explain insurance and utility theory.
7. Write force of mortality.
8. Explain multiple life functions.
9. Write about central rates of multiple decrement.
10. Write elements of compound interest.
11. Explain life annuities with monthly payments.
12. What is accumulation type benefits.
13. Explain true monthly premiums.

Section – C

2x10 = 20 M

Answer any two questions.

14. Explain models for individual claims and their sums, survival function.
15. Explain life table and it's relation with survival function examples.
16. Describe multiple decrement models, deterministic and random survivorship group
17. Explain distribution of aggregate claims, compound Poisson distribution.

Section – D

2x10 = 20 M

Answer any two questions.

18. Describe single payment, continuous life annuities, discrete life annuities.
19. Explain recursions and complete annuities-immediate and apportionable annuities-due.
20. Explain continuous and discrete premiums, true monthly payment premiums.
21. Explain continuous and discrete net premium reserve, reserves on a semi continuous basis.

P.R. Government College (Autonomous), Kakinada
Paper Title: Econometrics
VI Semester paper IV-C
MODEL PAPER

Time: 3 Hrs.

Max. Marks: 70M

Section –A

5X1 = 5 M

Answer all questions.

1. Define econometrics.
2. Define least square method.
3. Write any two assumptions of econometrics.
4. Multi colinearity.
5. Specification errors.

Section – B

5x5 = 25 M

Answer any five of the following questions. Each question carries five marks.

6. Explain scope of econometrics.
7. Write the limitations of econometrics.
8. Define single equation model for two variable case.
9. Explain estimation of error variance.
10. Write the assumptions of econometrics.
11. Explain multi colinearity.
12. Explain specification errors.
13. What is auto correlation.

Section – C

2x10 = 20 M

Answer any two questions.

14. Explain scope and objectives of econometrics.
15. Explain limitations and divisions of econometrics.
16. Explain reasons for introducing error term in the model.
17. Explain least square method of estimation.

Section –D

2x10 = 20 M

Answer any two questions.

18. Explain general liner model.
19. Explain testing of parameters of the models.
20. Explain effects of multi colinearity and detecting multi colinearity.
21. Explain Dubin-Watson-Dummyvariables.

P.R. Government College (A), Kakinada

DEPARTMENT OF MATHEMATICS AND STATISTICS

Work Load for Statistics and Actuarial Sciences

S. No	Name of the Class	No. of Theory Hours	No. of Practical Hours	No. of Batches	Total Practical Hours	Total hrs. (Theory + Practical)
1	I MSCS-stat	4	2	2	4	8
2	I MS Actuarial Stat	4	2	2	4	8
3	II MSCS-Stat	4	2	2	4	8
4	II MAS- Stat	4	2	2	4	8
5	II Actuarial Stat	4	2	2	4	8
6	III MSCs-stat	6+3	2+4	2	12	21
7	III MSCS-Actuarial Stat	6+3	2+4	1	6	15
Total Work Load for Statistics and Actuarial Sciences						76

List of Examiners

- | | |
|------------------------------|--|
| 1. Dr. N. SrinivasaRao | - Andhra Loyola college, Vijayawada |
| 2. Dr.D.V. Ramana Murthy | - SKVT College, Rajahmundry |
| 3. Smt.K.Madhavi | - Govt. Arts Degree College, Rajahmundry |
| 4. Dr.T.C.Ravi Chandra kumar | - Principal, Govt.Degree College, Tuni |
| 5. Anand | - Gayatri Vidhya Parishad, Vizag |
| 6. Gandhi | - AVN college, Vizag |
| 7. Dr. Hanumanth Rao | - MR College, Vizayanagaram |
| 8. Dr. Kalyani | - MR College, Vizayanagaram |
| 9. Gopala Rao | - MR College, Vizayanagaram |
| 10.M. Satyanarayana | - Govt.Degree College, Kadapa |
| 11. P.VaraLakshmi | - DKWC, Nellore |
| 12. Dr.Hariprasad | - GDC, Punganuru, Chittoor Dist |
| 13.A.Munniyya | - SVA GDC, Srikalahasthi |
| 14. Dr.GangaRam | - PVKN, GDC, Chittoor |

