Annexure No.	**20 A**
SCAA Dated	**29.02.2008**

BHARATHIAR UNIVERSITY :: COIMBATORE – 641 046

REGULATIONS FOR B. Sc. STATISTICS DEGREE COURSE
Semester System

(with effect from 2007-2008)

1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the **B. Sc. Statistics** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu with Mathematics / Business mathematics / Statistics as one of the subjects as only eligible or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree course shall consist of the following

   a) Part - I
   Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu. It shall be offered during the first four semesters with one examination at the end of each semester.

   b) Part – II : English
   The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester Part II English will be offered as communication skills.

   c) Foundation Course
   The Foundation course shall comprise of two stages as follows:
   Foundation Course A : General Awareness (I & II semesters)
   Foundation Course B : Environmental Studies (III & IV semesters)

   The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.

From the printed material supplied by the University	-	75%
Current affairs & who is who?	-	25%

   The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

Group A : Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

Group B: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

Group C: application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

Group D: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

Diploma Programme:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education

Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student's performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory
This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).

(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**
   a) a candidate will be permitted to appear for the university examinations for any semester if
      i) He/she secures not less than 75% of attendance in the number of working days during the semester.
      ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
      iii) His/her conduct has been satisfactory.

      Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65%of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**
   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) "Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.

6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil

irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**

11. **Conferment of the Degree**

No candidate shall be eligible for conferment of the Degree unless he / she,

i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.

ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**

A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.

The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be [permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-.

14. **Evening College**

The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**

The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**

The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**

Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.

BHARRATHIAR UNIVERSITY
Scheme of examination
Branch-II - B.Sc Statistics (2007-2008) onwards

Semester No.	**Part**	**Subject and paper**	**Instruc-tional hrs/ week**	University Examinations	
				Duration in hours	**Max. marks**
First	I II III	Language paper I	6	3	100
		English paper II	6	3	100
		Gr. A :Core Paper I Descriptive Statistics-I **Paper II** Descriptive Statistics-II Core Practical-1	 4 3 2	 3 3 -	 100 100 -
		Gr. B : Allied A **Paper I** Mathematics for Statistics-I	9	3	100
Total			**30**		**500**

Second	I II FC III	Language Paper I	6	3	100
		English Paper III	6	3	100
		Foundation course	2	3	100
		Gr –A :Core Paper III Time series, Index Numbers and Psychological Statistics	5	3	100
		Core Practicals-I	2	3	100
		Gr. –B : Allied A Paper-II Mathematics for Statistics-II	9	3	100
		Total	**30**		**600**
Third	I II III	Language paper I	6	3	100
		English paper III	6	3	100
		Gr. A:core Paper IV Demographic methods **Paper V** Probability Distribution-I Core practice- II	 3 3 2	 3 3 -	 100 100 -
		Gr. B: Allied B Paper I Computer programming for Statistical Analysis-I Allied Practical	 5 2	 3 -	 75 -
		Diploma course	3	3	100

Semester No.	Part	Subject and paper	Instructional hrs/ week	UNIVERSITY EXAMINATION	
				Duration in hours	Max marks
Fourth	I II FC III	Language paper I	6	3	100
		English paper III	6	3	100
		Foundation course B	2	3	100
		Gr. A: Core Paper VI Probability Distribution-II Practical	 4 2	 3 3	 100 100
		Gr. B Allied B Paper II Computer programming for Statistical Analysis-II Allied Practical	 5 2	 3 3	 75 50
		Diploma course*	3	3	100
Fifth	III	**Gr. A: core Paper VII** Statistical inference-I **Paper VIII** Basic Sampling theory **Paper IX** Design of Experiments Core Practical	 5 5 5 2	 3 3 3 -	 100 100 100 -
		Gr.C Appl. Ori sub A **Paper I** Numerical Mathematics **Paper II** Operations Research I	 5 5	 3 3	 75 75
		Diploma Paper III	3	3	100
Sixth	III	**Gr.A (core) Paper X** Statistical inference -II **Paper XI** Statistical Quality Control **Practical-III**	 5 5 4	 3 3 3	 100 100 100
		Gr. c (Appl. Ori. sub B) **Paper I** Elements of Econometrics **Paper II** Operations Research **Practical-IV**	 5 5 3	 3 3 3	 75 75 100
		Diploma *	3	3	100

SEMESTER-I **Core paper-I**

Subject title: Descriptive Statistics -I

Course number: **Number of hours: 5 hrs**

Subject description:

This course introduces the historical development of Statistics, presentation of data, descriptive measurers and fitting mathematical curves to the data

Goal: To enable the students understand and apply descriptive measures in Statistics.

Objective: On successful completion of the course students should have:
known the history of Statistics and
learnt data presentation in various forms

UNIT-1

Origin, scope, limitations and misuse of Statistics-Collection-Classification- Tabulation of data. Diagrammatic representation of data: one dimensional and two dimensional diagrams – graphic representation: line diagram, frequency polygon, frequency curve, histogram and Ogive curves.

UNIT-II

Measures of central tendency: Mean, Median, Mode, Geometric mean and Harmonic mean-Partition values: Quartiles, Deciles and Percentiles-Measures of Dispersion: Mean deviation, Quartile deviation and Standard deviation – Coefficient of variation.

UNIT-III

Moments- measures of Skewness-Pearson's and Bow ley's Coefficient of skewness, Coeffcient of Skewness based on moments – Kurtosis.

UNIT-IV

Curve fitting: principle of least squares, fitting of the curves of the form $y = a+ bx$, $y = a + bx + cx^2$ and curves transformable to the above form.

UNIT-V

Case study and problems relating to all the above units

Books recommended for study:

1. Mills, F.C : Statistical Methods-part I
2. Tara Yamane : Elements of Statistics
3. Guptha, S.C and Kapoor V.K : Fundamentals of Mathematical Statistics

SEMESTER-I **Core paper-II**

Subject title: Descriptive statistics -II

Course number: **Number of hours: 4 hrs**

Subject description:
This course introduces measurement of relationship in respect of quantitative and qualitative data and the concept of probability.

Goal: To enable the students understand the descriptive measures and probability

Objective:
On successful completion of the course, students should have understood correlation, regression and probabilities of events.

UNIT-I
Linear correlation-scatter diagram, Pearson's coefficient of correlation, correlation in a bivariate table, Rank correlation, Coefficient of concurrent deviation- Regression equations - properties of regression coefficients.

UNIT-II
Association of attributes: Relation between class frequencies, consistency of data, independence of attributes, criterion of independence, association of attributes: Yule's coefficient of association, Yule'coefficient of colligation.

UNIT-III
Probability: sample space-Concepts of events- Algebraic operations on events- Definitions of probability.

UNIT-IV
Generalized addition and compound Theorems of probability-independent events –Conditional probability –Baye's Theorem.

UNIT-V
Case study and problems related to all the above units

Books recommended for study:
1. Statistical Methods-part I by MILLS, F.C
2. Elements of Statistics by Tara Yamane
3. Fundamentals of Mathematical Statistics by Guptha, S.C and Kapoor V.K

SEMESTER-II Core paper-III
Subject title: **Time series, Index Numbers and Psychological Statistics.**

Course number: **Number of hours: 5 hrs**

Subject description:
This course introduces the basic Statistical tools in time related variables, economic variables and Psychology

Goal: To enable the students understand index numbers and other Statistical tools applied to Psychological and chorological data

Objective: On successful completion of the course, the students should have:
learnt to measure and analyze the data relating to economics and psychology.

Unit-I :(Time series)
Concept –components of time series –additive and multiplicative models-Resolving components of a time series-measuring trend: Graphic, semi-averages, moving average and principle of least squares methods .
UNIT-II: (Time series)
Seasonal variation- measuring seasonal variation: method of simple averages, ratio to trend method, ratio to moving average method and link relative method- Cyclical and Random fluctuations- variate difference method.

UNIT-II: (Index Numbers)
Index numbers and their definitions - construction and uses of fixed and chain based index numbers-simple and weighted index numbers - Laspeyre's, Paache's, Fisher's, and Marshall-edge-worth index numbers – optimum tests for index numbers-Cost of living index numbers.

UNIT-IV :(Psychological Statistics)
Percentile curve and percentile ranks-their uses –combination and comparision of examination scores-Norms and scaling procedures-The T scale C scale scaling of tests-Reliability of measurements- method of measuring reliability –Internal consistency reliability –item validity-special correlation methods.

UNIT-V
Case study and problems related to all the above units.

Books recommended for study:
1. Applied general statistics by Croxton, F.E & cowden, D.J (Prentice Hall)
2. Fundamentals of applied Statistics by Goon, A.M, Guptha, Das Guptha, B
3. Fundamentals of applied Statistics by Guptha S.C and Kapoor, V.K (S.chand &Co)
4. The advanced theory of Statistics by Kendall, M.G and Stuart, A Vol III (Charles criffin)
5. Fundamental statistics in Psychology and education by Guilford T.K

SEMESTER-II **Core practical-I**

Number of hours: 2 hrs

Descriptive Statistics I&II (Using computers MS-Excel)

1. Formation of frequency distribution. Calculation of arithmetic, geometric mean, median and mode .Calculation of percentile.

2. Formation of charts and diagrams: Histogram, bar diagram, Pie diagram frequency line, scatter diagram .Formation of Ogive curves.

3. Calculation of measures of dispersion: Range, Variance, Standard Deviation, Mean deviation, Quartiles.

4. Calculation of Skewness and kurtosis.

5. Problems related to curve fitting.

6. Calculation of correlation and regression coefficients and formation of regression lines

7. Fitting straight line, non-linear trend lines and calculation of trend values using moving averages .

8. Calculation of Index numbers.

Note: students should have exposure in MS -Excel

Three questions are to be answered out of **five** questions.

For problems: 80 marks
For record: 20 marks
Total : 100 marks

SEMESTER-III Group-A Core paper-IV

Subject title: DEMOGRAPHIC METHODS

Course number: **Number of credit hours: 3 (Three)**

Subject description: This course introduces the concepts, methods and analysis of data relating to vital events such as births, deaths… marriage… migration ….

Goal: To enable the students to have an exposure on the application of Statistical methods to analyze the demographic problems.

Objective: On successful completion of the course the students should have understood about registered information of vital events, measurement of the events such as birth and death rates, life tables and population projection techniques.

Unit-I:
Demography –definition-sources of demographic data-population census -demographic surveys-Registration method: vital registration-population register and other administrative records-registration of population in India.

Unit-II:
Fertility measurements –crude birth rates-general, specific and total fertility rates-gross and net reproduction rates and their interpretation.

Unit-III:
Mortality measurements: crude death rate- specific death rate-standardized death rate-infant mortality rate –maternal mortality rate –case fertility rate-comparative mortality index –force of mortality –graduation mortality rates-Makeham's law.

Unit-IV:
Description and construction of various columns of a life table and their relationships-construction
of an abridged life table –Reid and Pearl method-uses life table –migration-factors effecting migration-gross and net migration rates.

Unit-V:
Population projection –population estimates and projection –arithmetic geometric and exponential growth rates- logistics curve and its suitability for graduating population data-Basic ideas of stationary and stable population

Books for study:

1) Indian Population Problems by Agarwala, S.N (Tata Mc Graw Hill, Bombay)
2) Fundamentals of StatisticsVol.II by Goon A.M Guptha,M.K and Das Guptha (world press)
3) Fundamentals of Applied Statistics by Guptha ,S.C and Kapoor ,V.K (S.Chand &Co)
4) An introduction to the study of population by Mishra D.E (South India publishers, Madras)
5) Fundamentals of Demography by DR.Hansraj (Surjeet publications Delhi)
6) Principles of Population studies by Asha A .Bende and Tara karitkar (Himalaya publishing

SEMESTER-III Group-A Core paper-V

Subject title: PROBABILTY AND DISTRIBUTIONS-I

Course number: **Number of credit hours: 3(Three)**

Subject description: This course introduces the various concepts, functions and properties and theorems related to random variables.

Goal: To enable the students to understand and study random phenomena mathematically

Objective: On successful completion of the paper the students should have understood the concepts of random variable, discrete ,continuous, joint, marginal, conditional probability functions, expectation, conditional expectation and variance, generating functions, law of large numbers and central limit theorem and their applications.

Unit-I:
Random variables –discrete and continuous random variables –distribution function-properties-probability mass function and probability density function –various statistical measures of continuous probability distribution.

Unit-II:
Joint, marginal and conditional distribution functions and density functions- independence of random variables –Transformation of variables (one and two dimensional-concepts only).

Unit-III:
Mathematical expectation-properties-addition and multiplication therorems-cauchy-schwartz inequality, conditional expectation and conditional variance.

Unit-IV:
Moment generating function, cumulant generating function, characteristic function and their properties.

Unit-V:
Tchebychev's inequality, convergence in probability, weak law of large numbers and central limit theorem

Books for study;
1. Fundamentals of Mathematical statistics by Guptha, S.C &Kapoor, V.K (Sulthan chand &sons)
2. Introduction to Mathematical statistics by Hogg.R.V and and Craig ,A.G. (Amerin

SEMESTER-III Group-B ALLIED II –Paper I

Subject title: COMPUTER PROGRAMMING FOR STATISTICAL ANALYSIS-1
(C PROGRAMMING)

Course number: **Number of credit hours: 5 (Five)**

Subject description: This course introduces structured high level Computer programming Language C

Goal: To enable the students to understand and develop programs in C.

Objective: On successful completion of this course the students should have obtained the capability to develop programs for Statistical problems.

UNIT-I:
Introduction to C – Sample programs – Basic structure of C programs – Programming style – Constant, Variables and data types: Character set- C tokens – key words and identifiers – Declaration of variables – Assigning values to variables.
UNIT – II:
Operators – Arithmetic, Relational, Logical, Assignment, Increment and Decrement , Conditional, Bitwise – Expression – Arithmetic expression – Evaluation of expressions – Type conversion in expression – Mathematical function – Managing input and output operator – Reading a character, writing a character, formatted input and output.
UNIT- III:
Decision making and Branching: decision making with – IF statement – Simple IF statement – IF… ELSE statement – Switch statement – ?: Operator – GOTO statement – Looping : WHILE statement – DO Statement – FOR statement – Jumps in Loop – Function, classification of functions – Defining and declarations of functions.
UNIT – IV:
Array – One dimensional and two dimensional arrays – Initializing two dimensional array – handling of character strings – declaring and initializing string variables – string handling functions. Pointers – accessing the address of a variable – declaring and initializing pointers – accessing a variable through its pointers – pointers and arrays- Pointer expression.
UNIT – V:
Structure : Definition – structure initialization- arrays of structures- Files – defining , opening and closing of a file. Input / output operations on files – Error handling during Input / Output operations-Random Access to files – Simple programs based on statistics.

Books for study:

1. Programming in ANSI C by Balagurusamy, E (Tata Mgraw Hill)
2. Let us C by Yaswant Kanetker (BPBpublications New Delhi)

Semester III **Diploma paper- I**
Subject title: Actuarial statistics – I
Course number: **Number of credit hours: 3(Three)**

Subject description: This course introduces the underlying principles, history of life insurance
Goal: To enable the students to understand the sound financial line insurance.
Objective: On completion of this course the students should have understood the principal terms used and major life insurance products covered in Indian life insurance.

Unit – I: Principles of Life Assurance: Nature of Insurance – Classification of Insurance – History of Life Insurance in India.
Unit – II: Definition of whole life assurance –term assurance- pure endowment-endowment assurance – critical illness assurance – whole life level annuity-temporary level annuity-premium ,benefit – assurance and annuity contracts.
Unit – III: Derivation of means and variances of the present values of the payment under simple assurance and annuity contracts assuming constant deterministic interest – simple problems.
Unit IV: Expression in the form of sums for the mean and variance of the present values of benefit payments under simple assurance and annuity contract in terms of the curtate random future life time, assuming that death benefits are payable at the end of the year of death and annuities are paid annually in advance.
Unit V: Derivation of the relations between annuities payable in advance and in arrear, between temporary, deferred and whole life annuities.

Books for study: The study material of Institute of Actuaries of India:
Subject code CT-5- General insurance, Life and Health contingencies
ST2-Life Insurance for all the four diploma papers
The web site http:''www.actuariesindia.org/Education/Studymaterial.html can be viewed for getting the material

Semester IV **Group A** **Core Paper VI**

Subject title: PROBABILITY AND DISTRIBUTIONS – II
Course number: **Number of credit hours: 3(Three)**
Subject description: This course introduces probability functions for random variables that are defined for different probabilistic situations.

Goal: To enable the students to understand the properties and applications of various probability functions

Objective: On successful completion of the course the students should have understood the applications and nature of the probability distributions such as binomial ,poisson ….normal, t,χ^2 and F.

Unit I:
Binomial, Poisson and Negative-Binomial distributions – Moments, m.g.f, cumulants, additive property, recurrence relation for the probabilities- simple problems.
Unit II:
Geometric distribution – moments, m.g.f – Hyper-geometric distribution- mean, variance, m.g.f, Binomial as a limiting form of Hyper- geometric distribution – Multinomial distribution – moments
Unit III:
Normal distribution – limiting form of Binomial distribution, properties, median, mode, moments, m.g.f, cumulants, mean deviation, area property, simple problems – Rectangular distribution-moments, m.g.f. characteristic function, mean deviation – Bivariate normal distribution.
Unit IV:
Gamma, Beta distributions of I kind and II kind – constants – Exponential distribution – additive property.
Unit V :
Functions of normal random variable leading to χ^2, t and F distributions – inter relationship between the distributions and their properties.
Reference
1. Fundamentals of mathematical statistics By Gupta, S.C and Kapoor, V.K.,(Sultan chand & sons)
2 Introduction to Mathematical Statistics, Hogg R.V and Craig, A.G., (Amerind.)

SEMESTER-IV Group-A CORE PRACTICAL-II
(Calculator based) No. of credit hours (2+2) Four

DEMOGRAIC METHODS, PROBABILTY AND DISTRIBUTIONS-I&II

Demographic methods:

1. Construction of life table.
2. Determination of mortality, fertility and reproduction rates.
3. Population projection using polynomials and exponential function.
4. Fitting Gompertz curve.
5. Fitting logistic curve to population data by the method of Pearl and Reed.
6. Fitting of Logistic curve by Rhodes method.

Probability and Distributions I&II

1 . Fitting of Binomial distribution.
2 Fitting of Poisson distribution.
3. Fitting of Normal distribution by the method of ordinates.
4. Fitting Normal distribution by area method.

Three questions are to be answered out of **five** questions

For problems:		80	marks
For record	:	20	marks
Total	:	100	marks

SEMESTER-IV Group-B ALLIED II-Paper II

Subject title: COMPUTER PROGRAMMING FOR STATISTICAL ANALYSIS-II
(Object oriented programming with C++)

Course number: **Number of credit hours: 5(Five)**

Subject description: This course introduces the concept of object oriented programming language
which is a higher version of C programming language

Goal: To enable the students to understand and develop programs in C++.

Objective: On successful completion of this course the students should have obtained the capability to develop programs for Statistical problems using OOP's concept

Unit – I:

Principles of OOP, Basic concepts of OOP– Benefits and application of OOP – C++ structure – tokens , expressions and control structures and functions.

Unit – II:

Classes and object – Functions prototyping – call by reference – return by reference – Inline functions – functions overloading – Friend and virtual functions – specification of class – member function – private member functions – Arrays within class – memory allocation for objects – array of objects – static and constant member functions.

Unit – III:

Constructors, Destructors and operator overloading: Constructors – parameterized constructors – copy constructor – Dynamic constructors – Destructors – Definition of operator overloading – overloading binary operators – manipulation of strings using operators – Rules for overloading operators.

Unit – IV:

Inheritance, Pointers, Virtual functions and polymorphism. Derived classes, single and multiple inheritance, hierarchical and hybrid inheritance, virtual base classes, Abstract classes, Pointers to objects, pointer to derived classes, virtual functions.

Unit – V:

Files and Templates: File operations **–** Templates, class templates, function templates, member function templates.

Books for study:

1) Object oriented programming with C++ by Balagrursamy,E (Tata McGraw Hill)
2) Programming with C++ by D.Ravichandran (Tata McGraw

SEMESTER-IV Group-B ALLIED II -PRACTICAL

(C&C++ PROGRAMMING)

No. of credit hours :(2+2) Four

Problems:

1. Program to form a frequency distribution for the given data $x_1, x_2, x_3 \ldots\ldots, x_n$, give the number of class intervals K and the width of the class intervals W.
2. Program to find the arithmetic mean, geometric mean and harmonic mean for the given frequency distribution.
3. Program to find Mean, Variance, Standard Deviation and Coefficient of variation.
4. Program to find the three quartiles Q1, Q2 and Q3 and the coefficient of skewness.
5. Program to find the first four moments about origin A and to find β_1, β_2, γ_1 and γ_2.
6. Program to find simple correlation and regression coefficients for the given bivariate data.
7. Program to fit a straight line of the form y = ax + b using the principle of least squares to the given bivariate data.
8. Program to fit Binomial distribution.
9. Program to fit a Poisson distribution.
10. Program to arrange one dimensional array of numbers in ascending and descending order.
11. Program to evaluate a matrix polynomial of the type $aX^2+bX+cI$ where X is a matrix of order 3 x 3 and I is an identity matrix and a , b and c are constants.
12. Program to solve the given system of simultaneous equations of three variables.
13. Program to open a file and store data in it and to read and display the data from the file

****

For problems:	40	marks
For record :	10	marks
Total :	50	marks

Two questions to be answered with internal choice one from C and one from C++

Semester-IV

Group D Diploma paper II

Subject title: Actuarial statistics – II
Course number: **Number of credit hours: 3(Three)**

Subject description: This course introduces the types of life insurance products and calculations and premium calculations

Goal: To enable the students to gain more knowledge in life insurance products.

Objective: On completion of this course the students should have under stood the needs of consumers **versus** the objectives of the insurer

Unit – I: Calculation of net premiums and net premium reserves of simple insurance contracts using ultimate or select mortality- Definition of the net random future loss under an insurance contract – state the principle of equivalence.

Unit – II: Calculation of net premiums for the insurance contract benefits in terms of premiums and annuities may be payable annually, more frequently than annually or continuously.

Unit – III: Types of Life Insurance products – purpose of the products for the insurer and insured- benefits and risks of these products to the insurer and insured-Single or periodic, payments from the date of death-payments on survival-periodic payments on continual survival.

Unit IV: Single or regular premium – without profits – non linked – unit linked – index linked – with profits – Single Joint or Group Life Basis – with or without conversion options and option to change the level of benefits.

Unit V: Cash Bonus – Premium reduction – benefit increase- additions to benefits method – revalorization method – contribution method – technique of asset shares – recursive formula and its uses.

Books for study: The study material of Institute of Actuaries of India:
Subject code CT-5- General insurance, Life and Health contingencies
ST2-Life Insurance for all the four diploma papers
The web site http:''www.actuariesindia.org/Education/Studymaterial.html can be viewed for getting the material

Semester V **Group A** **Core Paper VII**

Subject title: STATISTICAL INFERENCE – I

Course number: **Number of credit hours: 5(FIVE)**
Subject description: This course introduces concepts, methods and properties relating to estimation

Goal: To enable the students to understand and apply various estimation procedures

Objective: on successful completion of this course the students should have understood the concepts of Point estimation and interval estimation, and their properties, calculation of partial and multiple correlation coefficients and multiple linear regression line.

Unit I

Concept of Statistical Inference- Parametric estimation- Sampling distribution - Standard Error. Derivation of Standard Error of mean, variance, proportion, difference between means variances and Proportions-concept of ordered statistics.

Unit II

Point Estimation: Estimator, properties of point estimator – unbiasedness, consistency, Crammer Rao inequality – efficiency – asymptotic efficiency and sufficiency of the estimator – Rao Blackwell theorem.

Unit III

Methods of point estimation: method of maximum likelihood, method of minimum chi-square and method of moments - properties of estimators obtained by these methods (Without proof).

Unit IV

Interval Estimation: Fiducial limits-derivation of confidence intervals based on Normal,'t' χ^2 and F distributions. Confidence intervals- using Cramer – Rao inequality-Partial and multiple correlation and regression coefficients – Multiple linear regression lines.

Unit V

Numerical problems in interval estimation, multiple and partial correlation and regression. –simple problems only

Books for study:

1. Introduction to mathematical statistics by Hoel P.G : (Wiley International)
2. Statistical methods by Snedecor, GW and Cochran, WG (Oxford and I B H)
3. Introduction to mathematical Statistics by Hogg V and Craig .R (Amerind)
4. Theory and application of Statistics Vol. II by Ramasamy, M.M :
5. Introduction to Mathematical Statistics by Brunk, H.D (Ginn and Co.)
6. A first Course in Mathematical Statistics by Weather Burn CE (Cambridge University press)

SEMESTER-V GROUP-A Core paper-VIII

Subject title: BASIC SAMPLING THEORY

Course number: **Number of credit hours: 5(Five)**

Subject description: This course introduces the concept, methods and analysis of sampling techniques

Goal: To enable the students to understand and apply the sampling procedures to different situations

Objective: On successful completion of the course the students should have understood sample and census surveys, errors that occur in surveys and various sampling methods and the different types of populations to which these sampling methods are applicable.

Unit-I:
Sampling from a finite population –Random sampling –simple sampling with and without replacement –unbiased estimates of the mean and the variance of the population and of the variance of the estimator of the mean - Estimation of the sample size.

Unit-II: Stratified sampling – proportional and optimum allocation with regard to stratified random sampling-unbiased estimates of the mean and the variance of the population and of the variance of the estimator of the mean.

Unit-III:
Systematic sampling –Unbiased estimates of the mean and the variance of the population and of the variance of the estimator of the mean.

Unit-IV:
Cluster and two stage sampling –unbiased estimates of the mean and variance of the population and of the variance of the estimator of the mean.

Unit-V:
Design, organization and execution of sample surveys –sampling and non-sampling errors and methods to deal with sampling errors.

Books for study:
1. Sampling Techniques by Cochran, W.G (Wiley Est)
2. Sampling theory of survey with applications by Sukathme P.V and sukathme B.V (Asia pub.House)
3. Sampling theory and Methods by Murthy, M.N (Statistical publishing

SEMESTER-V GROUP-A Core paper-IX

Subject title: DESIGN OF EXPERIMENTS

Course number: **Number of credit hours: 5(Five)**

Subject description: This course introduces various experimental designs, selection of appropriate designs in planning a scientific experimentation

Goal: To enable the students to understand the principles of experimentation and employ suitable designs in experiments

Objective: On successful completion of this course the students should have understood the concept of analysis of v**a**riance, to compare more than two treatments with the help of F distribution for various designs employed, to estimate missing observations, to compare the efficiencies of various designs and the concept of ANCOVA

Unit-I:

Linear design models-Least Square estimates of parameters and variance of estimates –Analysis of variance: One way and two way classifications.

Unit-II:

Fundamentals of experimentation: Plot and pen techniques –determination of shape and size of plots – Uniformity trials –Replication, randomization and local control techniques

Unit-III:

Analysis of different experiments: CRD, RBD and LSD and their efficiencies

UNIT-IV:

Missing plot techniques (atmost two values)-Analysis of covariance (ANCOVA) with one concomitant variable to CRD and RBD.

Unit-V:

Factorial designs -2^2,$2^3$and 3^2 factorial designs with and without confounding.

Books for study:

1. Experimental designs by Cochran W.G and Cox G.M (john Wiley)
2. Experimental design: Theory and applications by Federar, WT (Oxford and IBH)
3. Statistical theory in research by Anderson RL and Bangrtt TA (McGraw HILL)
4. The design of Analysis of Experiments by Kempthrone,B (Wiley Eastern)
5. Fundamentals of Statistics by Goon, A.M., Guptha M.K and Das Guptha (World press)
6. Design and Analysis of Experiments by Das, M.N., and Giri, N.L (wiley Eastern)

Semester V Group C AOS – Paper I
Subject title: NUMERICAL MATHEMATICS
Course number: **Number of credit hours: 5(Five)**
Subject description: This course introduces the concepts and methods to analyze numerical data

Goal: To enable the students to establish mathematical functions using numerical data

Objective: On successful completion of the course the students will be able to estimate functional relationship, interpolate and extrapolate the value of dependent variable, find maxima and minima using differentiation, and integral value of the estimated function and sum the given series

Unit I

Finite differences – difference of a polynomial, factorial polynomial- Interpolation for equal intervals – Newton-Gregory forward and backward interpolation formulae.

Unit II

Central difference interpolation formulae, Gauss forward and backward formulae, Stirling's, Bessel's and Laplace – Everett's formulae, summation of series.

Unit III

Interpolation for unequal intervals: Newton's divided difference formula and Lagrange's formulae, Inverse interpolation.

Unit IV

Numerical differentiation and integration- Numerical differentiation up to second order, maxima and minima- Numerical integration : Trapezoidal, Simpson's 1/3 rd and 3/8th rules

Unit V

Iterative method of Eigen vales – Power method, Jacobi method, Solution of system of Non- Linear equations – Newton – Rapson method.

References

1. Introductory Methods of Numerical Analysis by Sastry, SS (1998), (Prinitce Hall of India, New Delhi. Third Edn),
2. Numerical Methods by Kandasamy. P. Thilagavathy,. K and Gunavathy.K (2003), S.chand & Co, New Delhi.

Semester V Group C AOS – Paper II
Subject title: OPERATIONS RESEARCH – I
Course number: **Number of credit hours: 5(Five)**

Subject description: This course introduces the concepts, models and problem solving techniques of optimization problems

Goal: To enable the students gain knowledge about various optimization techniques

Objective: After completion of the course the students will be able solve problems related to business and industry using linear programming techniques, Transportation and Assignment models.

Unit I : Origin, Meaning and Scope of operations Research –operations research model building, their types and the outline of the methods of solution.
Unit II: Linear programming: optimization problem - programming problem – solution by graphical method, simplex method – slack , surplus and artificial variables - Improving a basic feasible solution- optimality conditions.
Unit III: Degeneracy (Concept only) and breaking ties – Charne's Big M – technique-conversion of a minimization problem to a maximization problem.
Unit IV : Transportation problems :Introduction – the simplex method and transportation problems – obtaining an initial and feasible solution – by North – West corner rule – Vogel's method – Least cost entry method – MODI method for optimality. Degeneracy (concept only).
Unit V : Assignment problem: The assignment problem as a special case of the transportation problem – traveling sales man problem.
Books recommended

1. Linear programming methods and applications by Gass SI (MC Graw Hill)
2. Linear programming by Loomba : (Tata MC Graw Hill)
3. Fundamentals of operations Research by Ackoff , R.I And Sasieni, MW : (Wiley International)
4. Operations Research – Methods and problems by Sasieni, Yaspen and Friedman (wiley International)
5. Operations Research by Kanti Swarup , Gupta PK and Manmohan (Sultan Chand and Sons)

(Theory 50% and problems 50% be asked in the question paper)

SEMESTER –V DIPLOMA PAPER III
(FOR THE B.SC. STATISTICS STUDENTS ADMITTED DURING 2007-08 AND ONWARDS)
SUBJECT TITLE: ACTUARIAL STATISTICS – III

Course number: **Number of credit hours: 3(Three)**

Subject description: This paper introduces business, economic and political environments relating to Indian life insurance.

Goal: To enable the students to have exposure on various acts relating to insurance business environment.

Objective: On completion of this course the students should have understood the effect of general insurance business environment in India including the impact of level of risk to the insurer.

Unit–I: Insurance Business Environment – Regularity Environment – Insurance act 1938- Insurance regularity and development authority act 1999, LIC of India act 1956, and General Insurance Business act 1972– Legal Environment – Motor vehicles act 1939 - The public liability insurance act 1991- The Indian steam vessels act 1917- Marine Insurance act 1963- The carriage goods of sea act 1925- Indian Railways act 1890- The carriers act 1865- Indian Post Office act 1898- The carriage air act 1993- Consumer protection act 1986- Indian information technology act 2000 (purposes and salient features of these acts only)

Unit – II: The Economic environment – National income – 5 year plans, Recession Fiscal policy – Value Added Tax (VAT), Information Technology, Telecommunication Technology, World Economic forum – Agricultural sector – Natural resources.

Unit– III: Political Environment, Pollution-age profile, Income and savings, education, health, Employment spending and saving patterns, Readership, ethos and culture

Unit – IV: Life table – Features – source of information – construction, interpretation, human mortality, Life table function, Non-integer ages uniform distribution of deaths.

Unit – V: Constant force of mortality, Mortality, characteristics, shape of q_x, l_x, and dx. Evaluation of means and variance with and without life table.

Books for study:

1. IC-12 Insurance Business Environment, By S.Balachandran Insurance Institute of India
2. CT-5 General Insurance, Life and health contingencies, Institute of Actuaries of India.

SEMESTER-VI Group-A Core paper-X

Subject title: STATISTICAL INFERENCE-II

Course number: **Number of credit hours: 5 (five)**

Subject description: This courses introduces the concepts of hypothesis testing

Goal: To enable the students to give inference on statistical population based on sample statistics

Objective: On completion of the course the students should have gained knowledge on the methods of testing the hypothesis on different distributions and also the nature of statistics to which such test procedure can be used

Unit-I: Testing of Statistical hypothesis: Statistical hypothesis -simple and composite hypothesis, null and alternative hypotheses-sample and parameter space –two types of errors – critical region-power a test –Neyman- Pearson Lemma –simple applications

Unit-II: Most powerful tests-uniformly most powerful and unbiased tests based on Normal, t, and χ^2 and F distributions (with out proof)-likelihood ratio criterion –definition and simple applications

Unit –III: Test of significance –Asymptotic and exact tests based on Normal, t, and χ^2 and F distributions with regard to mean, proportion, variance, Standard deviation, coefficient of correlation, regression coefficients, partial and multiple correlation coefficients-Concept of observed significance level.

Unit-IV: Contingency table –Test for independence by contingency tables –goodness of fitness tests –tests of homogeneity of variances, correlation and proportions .Test of Normality (application only).

UNIT-V: Elementary ideas on distribution –free and non-parametric tests –Run, Median, Sign and Mann Whitney tests (without proof)-Equality of two distributions.

Books for study

1. Introduction to Mathematical statistics by Hogg, R.V and Craig, AG (amrend)
2. Introduction to Mathematical statistics by Hoel, P.G (Wiley International)
3. Statistical Methods by Snedecor, G.W and Cochran W. G (oxford and IBH)
4. Introduction to Mathematical Statistics by Brunk .H.D (Gann Co)
5. Practical Non-parametric Statistics by Conover (wiley International)
6. Fundamentals of Mathematical statistics by Guptha S.C and Kapoor V.K(Sulthan chand &sons)

SEMESTER VI GROUP A Core Paper XII
Course title: STATISTCIAL QUALITY CONTROL
Course number: **Number of credit hours: 5(Five)**
Subject description: This course introduces the application of statistical tools on industrial environment to study, analyze and control the quality of products

Goal: To enable the students to know the concepts of process control and product control

Objective: on successful completion of the course the students should have understood various tools used such as control charts, sampling plans, quality system standards and reliability concepts to control the quality of industrial outputs.

Unit – I: Need for SQC – Role of frequency distribution – Statistical basis for SQC – variable control charts – $\bar{X}$, R and σ charts.
Unit II: Control Chart for attributes – np, p, c and u chart – Group control chart, OC and ARL of control charts, CUSUM charts using V- mark and decision intervals (concepts only)
Unit III: Acceptance sampling for Attributes – Single sampling plan – Double sampling plan – OC, AOQ, ASN and ATI curves – sequential sampling plan and their properties.
Unit IV: Quality system standards – ISO 9000- Elements of ISO – 9000 – Benefits of ISO 9000- Elements of a quality system – Documentation ISO 9000 accreditation
Unit V: Reliability concepts and measures, components and systems, reliability function, hazard rate, common life distribution viz, exponential, gamma and weibull.
Books for study:
1. Fundamentals of Applied statistics by Gupta S.C and Kapoor, V.K –
2. Quality control and Industrial Management by Dunkan A.J.(Richard D.Irwin Inc.USA)
3.Statistical Quality Control by R.S. Leaven worth (Mc Graw Hill)
4 Statistics of Quality control, Sampling Inspection and Reliability by Biswas S (1996)(New Age Intl)
5.Statistical Analysis of Reliability and Life Testing Models, by Bain, L.J and Englehard, M. (1991) (Maral Dekker)

Semester V **Group C** **AOS – Paper III**
Subject title: ELEMENTS OF ECONOMETRICS
Course number: **Number of credit hours: 5(FIVE)**
Subject description: This course introduces the application of statistical methods to economic phenomena.
Goal: To enable the students to establish and verify economic relationships

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.

Unit I: Definition-Scope-objectives of Ecnometrics-Limitations-Divisons of Econometrics.

Unit II: 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 model-Estimation of error variance –Simple problems.

Unit III: General linear model-Assumptions –Least square method of estimation and testing of the parameters of the models –problems under failure of assumptions.

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

Unit V: Econometric models in planning: Mahalanobis four sector model-criticism of the model-problems-problems relating to three variable linear model and test for auto correlation.

Books for study:

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)
4.Ecnometrics and mathematical Economics by S.P Singh ,Anil K.Parashar and H P Singh (S.Chand & Co.)

Semester V I Group C AOS – Paper IV
Subject title: OPERATIONS RESEARCH – II
Course number: **Number of credit hours: 5(five)**
Subject description: This course introduces the concepts, models and problem solving techniques of optimization problems
Goal: To enable the students gain knowledge about various optimization techniques
Objective: After completion of the course the students will be able solve problems related to business and industry using Network analysis, Sequencing, Replacement problems, Game theory ,Decision anlaysis…
Unit 1: Network analysis: Introduction – Network construction – Critical path method (CPM) – Labelling method – Method based on time estimates – Earliest and latest times. Project evaluation and Review techniques (PERT) – Algorithm for PERT - Difference between CPM and PERT. - simple problems.
Unit II: Sequencing : Introduction – n jobs and two machines, n jobs and three machines, n jobs and m machines – idle times and total elapsed time calculations.
Unit III Replacement Problem: Replacement models and their solution: Replacement of items whose maintenance costs increase with time and the value of money remains same during the period – Replacement of items whose maintenance costs increase with time and the value of money also changes with time, Replacement of items that fail completely : individual and group replacement policy – simple problems .
Unit IV: Game Theory: Description of games - solving the rectangular, two person, zero sum games: Saddle point and dominance methods-Graphical methods for 2xn and nx2 game problems.
Unit V: Decision Analysis: Types of decision models – Alternative Decisions –States of Nature – Outcomes. Decision making under conflict and uncertainty-minimax and maximin criteria, The Huruwiez criterion, the Laplace criterion and the Minimax regret criterion- simple problems- The expected monetary value criterion (EMV) - Decision Tree analysis: concept and simple problems simulation – Monte Carlo method only.

BOOKS for study:
1. Linear programming methods and applications by Gaus SI (Me Graw Hill)
2.Linear programming by Loomba (Tata Mc Graw Hill)
3. Fundamentals of operations Research by Ackoff,R.I. and Sasieni ,M.W (Wiley International)
4.Operations Research – Methods problem by Sasieni,Yaspen and Friedman (wiley international)
5 Operations Research by Kanti swarup , Gupta ,P.K and Manmohan (Sultan Chand and sons)

(Theory 50% and problems 50% be asked in the question paper)

SEMESTER-VI **Group-A** **Core practical III**

(Using statistical software package**)**

Number of credit hours: 2+2(Four)

Unit I:

Essential terminology for all SPSS users-getting to SPSS for windows - the components of window - SPSS for windows screens – crucial preliminaries-entering data into SPSS-editing data-saving data file-retrieving data file.

Unit II:

Merging data files –adding scores to existing cases –add variables – running a simple analysis and obtaining the output.

Unit-III

Checking the data –Box plots of score distributions –listing of the data using case summaries –graphs –bar, line, pie chart, scatter plots and histograms.

Unit IV

Frequency distribution-measures of frequency distributions-cross tabulations – obtaining two sample chi-square tests-log linear analysis –parametric statistical tests –comparing means-paired and unpaired t-tests

Unit V

Correlation and multiple regession-analysing nominal and ordinal data-non parametric analysis-

Wilcoxon, mann-whitney, Kruskal Wallis tests –ANOVA: one way

Books for study and reference

Clifford E.Lunneborg (2000). Data analysis by resampling: concepts and applications .Dusbury Thompson learning .Australia.

Everrit ,B.S and Dunn,G(2001).applied multivariate data analysis . Amol London.

Jeremy J.foster(2001).data analysis using spss for windows. New edition. Versions 8_10.sage publications .London

Michael S Louis-Beck (1995).Data analysis an introduction,series:quantitave applications in the social sciences .Sage publications. London.

Three questions are to be answered out of **five** questions

For problems:		80	marks
For record	:	20	marks
Total	:	100	marks

SEMESTER-VI

Core practical paper-IV **Number of credit hours: 5(Five)**

(Using Calculator)

Problems:

UNIT-I

Statistical inference-1:

1. Estimation of parameters of the distribution by the methods of moments and maximum likelihood with regard to discrete and continuous distributions
2. Confidence intervals based on Normal,χ2,t and F distributions
3. Determination of partial and multiple correlation coefficients-Multiple linear regression line and linear prediction involving three variables when the sums of squares and products are given.

UNIT-II

Basic sampling theory:

1. Estimation of mean and variance of the population and the variance of the estimator of the mean using Simple random procedure.
2. Stratified random sampling –Estimation of mean and variance of the population and of the variance of the estimator of the mean under proportional and optimum allocation.
3. Systematic sampling.

UNIT-III

Design of experiments:

1. Analysis RBD and LSD lay outs
2. Missing plot techniques in RBD and LSD
3. Analysis of 2^2,$2^3$and 3^2 factorial designs with and without confounding.
4. Analysis of covariance with one concomitant variable to RBD.

UNIT-IV:

Statistical inference-II:

1. Standard Normal and exact tests of significance with regard to mean, variance, proportion, correlation and regression coefficients and partial multiple correlation coefficients
2. Test for homogeneity several variances-Bartlett test

Statistical quality control:

1. Control chat for attributes and variables**:** $\bar{X}$, R, p, np and c charts
2. Single sampling plan for attributes: OC, ATI, AOQ curves.
3. Single sampling plan for variables: OC curves: known and unknown standard deviation.

Three questions to be answered out of five questions.

One question to be asked from each unit.

For problems:		80	marks
For record	:	20	marks
Total	:	100	marks

SEMESTER -VI
DIPLOMA PAPER IV
(FOR THE B.SC STATISTICS STUDENTS ADMITTED DURING 2007-08 AND ONWARDS)

SUBJECT TITLE: ACTUARIAL STATISTICS – IV

Course number: **Number of credit hours: 3(Three)**

Subject description: This paper introduces various types of risk and concepts relating to retirement benefits.
Goal: To enable the students to know the basic features of various insurance instruments.
Objective: On completion of the course the students should have gained knowledge in basic principles of insurance.

Unit–I: Concept of Risk – Peril and hazard – Different types of risks – classifications of risks – risk management – self insurance – advantages – IFRIMA

Unit–II: Classification of Insurance Business: Fire insurance – Marine insurance Motor Insurance- theft insurance – Health insurance – Engineering, Glass, liabilities – indemnity – Credit Insurances – Fidelity, Legal expenses, live stock insurances – Insurance Agent, broker, Consultant, Representative, Surveyor.

Unit–III: Basic Principles – Valid Contract – Utmost good faith – Duty renewal – Nomination – Assignment – Insurance Interest – Property Insurance – Features of Insurance Interest – Possession – Indemnity.

Unit–IV: Multiple decrement table – Dependent and independent rates – Obtaining dependent rates from independent rates – Independent rates form dependent rates.

Unit–V: Pension benefit and concentration – Accrued benefit – Age retirement benefit – future service benefit – ill–health retirement benefit – Death in service benefit.

Books for study:

1. IC-01 Principles of insurance By P.J Majmudar and M.G Diwan, Insurance Institute of India.
2. CT-5 General Insurance, Life and health contingencies, Institute of Actuaries of India.

MODEL QUESTION PAPERS
First Semester
Part III—Branch II—Statistics
Core paper-I:Descriptive Statistics-I

Time: 3 hours **Model question paper** Maximum: 100 marks

SECTION –A (10x1= 10 MARKS)
Answer ALL questions.
Choose the best answer:

1. A table is a systematic arrangement of statistical data in
   a) Columns b) Rows c) Columns and Rows d) None of these

2. Diagrams and graphs are tools of
   a) Collection of data b) Analysis c) Presentation d) Summarization.

3. Which of the following is a measure of central value?
   a) Median b) Standard deviation c) Mean deviation

4. Quartile deviation is equal to
   a) Inter quartile range b) Double of the inter quartile range
   c) Half of the inter quartile range d) None of the above

5. For a positive skewed distribution, which of the following inequality holds?
   a) Median>Mode b) Mode > Mean c) Mean >Median d) Mean>Mode

6. If the coefficient of skewness is zero then the distribution is
   a) J-shaped b) U-shaped c) Symmetrical d) L-shaped

7. To fit a straight line of the form Y=a +bx we need to solve
   a) One normal equation b) Two normal equations
   c) Three normal equations d) Four normal equations

8. The equation of a parabola is
   a) y= a+bx b) $y= a + bx + cx^2$ c) $y=ab^x$ d) $y= e^{ax}$

9. Kurtosis refers to
   a) Symmetry b) Peakedness c) Histogram d) None of these

10. The geometric mean of 2 and 8 is
    a) 5 b) 3.2 c) 4 d) none of these

SECTION –B (5x6= 30 MARKS)
Answer ALL questions.
All questions carry equal marks

11.a) Explain the importance of Statistics .

Or

b) Expalin the various types of bar diagrams with suitable examples.

12. a) Define median and write its uses.

Or

b) Calculate the mean deviation from the following data:

Class interval:	2-4	4-6	6-8	8-10
Frequency:	3	4	2	1

13.a) what is skewness? Explain the different types of skewed curves.

Or

b) Calculate Karl Pearson's coefficient of Skewness for the given data given below:

Measurement:	11	12	13	14	15
Frequency :	3	9	6	4	3

14. a) Explain the procedure to fit a curve of the following form $y=a+bx+cx^2$

Or

b) Fit a straight line to the following data

x:	0	1	2	3	4
y:	1	1.8	3.3	4.5	6.3

15. a) Represent the following data by means of a pie diagram

Items	expenditure
Food	120
Clothing	80
Rent	60
Education	40
Fuel	20
Savings	40
Miscellaneous	40

Or

b) Calculate the standard deviation to the following data

Size of items:	6	7	8	9	10	11	12
Frequency :	3	6	9	13	8	5	4

SECTION –C (5x12 =60 MARKS)

Answer ALL questions.

All questions carry equal marks

16 a) what do understand by classification of data? Discuss their importance.

Or

b) Draw a histogram to represent the data given below.

Weekly wages:	10-15	15-20	20-25	25-30	30-35	35-40	40-45
No. of workers	7	19	27	15	6	5	2

17.a) calculate the mean and mode for the following data

Profit per shop:	0-10	10-20	20-30	30-40	40-50	50-60
No. of shops:	12	18	27	20	17	6

Or

b) Calculate quartile deviation and its coefficient of A's monthly earnings for a year

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Monthly: Earning	239	250	251	251	257	258	260	261	261	262	273	275

18.a) Explain moments in detail.

Or

b) Calculate the first four moments about mean and the value of β_1 and β_2

x:	2	3	4	5	6
y:	1	3	7	3	1

Or

19 a) describe Bowley's coefficient of skewness and state its uses.

Or

b) Find Bowley's coefficient of skewness.

Marks:	10	20	30	40	50	80
No. of students	4	7	15	8	7	2

20. a) define the method of least squares. Also write the procedure to fit a straight line of the form

y=a + bx

Or

b)Fit a parabola to the following data

Year:	1986	1987	1988	1989	1990
Sales in lakh of tons:	100	20	110	140	80

B.SC. DEGREE EXAMINATION.

First Semester

Part III - Statistics

Core paper-II : Descriptive statistics-II

Time : Three Hours **Model question paper** Maximum : 100 Marks

Section A – (10x1=10)

Answer ALL the questions

Choose the best answer.

1. $1 - \left[\frac{6\sum d^2}{n(n^2-1)}\right]$ is the formula for

(a) Correlation coefficient b) Rank Correlation coefficient
(b) Regression equation d) Regression coefficient

2. If one of the regression coefficients s positive another regression coefficient is
(a) Negative (b) Positive
(c) Zero (d) ∞

3. Two attributes A and B are said to be negatively associated if (AB) is

(a) $> \frac{(A)(B)}{N}$ (b) $< \frac{(A)(B)}{N}$ (c) $= \frac{(A)(B)}{N}$ (d) =none of these .

4. In the association of attributes, if (AB)=135,
(a) 250 (b) 350
(c) 450 (d) 150

5. In tossing a coin., the number of exhaustive cases are
(a) 6 (b) 36
(c) 4 (d) 2

6. If all the events Ai (I = 1,2,….,n) are mutually disjoint then p $\left[\bigcup_{i=1}^{n} A_i\right]$ is

(a) $\geq \sum_{i=1}^{n} P(A_i)$ (b) $\leq \sum_{i=1}^{n} P(A_i)$ (c) $= \sum_{i=1}^{n} P(A_i)$ (d) None of these.

7.If A and B are independent events, then P(A) P(B) =
(a) $P(A \cup B)$ (b) $P(A \cap B)$
(c) ϕ (d)

8. The conditional probability ---- is not defined if P(B)=

(a) 1 (b) 0 (c) 1/2 (d) None of these

9. For two independent variables the correlation is

(a) r (X,Y) = 1 (b) r (X,Y) = 0 (c) r (X,Y) = -1 (d) r (X,Y) = 0.5

10. If two variables are uncorrelated, the lines of regression become

(a) Perpendicular (b) Parallel (c) Non-linear (d) None of these

SECTION B- (5x6=30 Marks)
Answer ALL questions
All questions carry equal marks

11. (a) Why there are two regression lines? Explain.

(OR)

(b) Prove that coefficient of correlation lines between the values -1 and +1.

12. (a) Calculate the correlation coefficient for the following data:

X	:	100	200	300	400	500
Y	:	2	3	4	5	6

(b) What are the differences between correlation and regression?

13. (a) Find out the coefficient of association from the following data:

(OR)

	Passed	Failed	Total
Married	90	65	155
Unmarried	260	110	370

(b) Explain:

(i) Independence of attributes
(ii) Association of attributes

14. (a) Explain the following terms:

(i) Sample space
(ii) Mathematical probability
(iii) Statistical probability

(OR)

(b) A problem in Statistics is given to four students A, B, C and D whose chances of solving it are 1/4, 1/5, 1/2, 1/\3 respectively. If all of them try independently, find the probability that the problem will be solved.

15. (a) Explain :

(i) Independent events
(ii) Conditional probability

(OR)

(b) State and prove generalized addition theorem of probability

16. (a) State and prove any two properties of Regression Coefficients.

(OR)

(b) Calculate the rank correlation coefficient from the following data:

X	:	80	78	75	75	68	67	60	59
Y	:	12	13	14	14	14	16	15	17

17. (a) Show that for *n* attributes A1, A2, A3, ……, An and for N total number of observation,
(A1A2A3…An)

(OR)

(b) Find whether A and B are independent, positively associated or negatively associated, in each of the following cases:

(i) N= 1000, (A)=470 (B)=620, (AB)=320.
(ii) (A)=490, (AB)=294, (a)=570, (αβ)=380.
(iii) (AB)=256, (αβ)=768, (Aβ)=48 and (αβ)=144.

18. (a) (i) A card is drawn from a pack of 52 cards. Calculate the probability of getting either a King or Queen

(OR)

(b) For any two events A and B, show that

(i) P(A)
(ii) P
(iii) P

19. (a) State and prove generalized compound theorem of probability

(OR)

(b) State and prove Bayes' theorem.

20. (a) Regression equation of two variables X and Y are 4Y-5X=0 and 5Y-X-63=0. Calculate the mean values of X and Y and the coefficient of correlation between X and Y.

(OR)

(b) Describe scatter diagram with examples.

SECOND SEMESTER

PART III – STATISTICS

Core paper-III: TIME SERIES, INDEX NUMBERS AND PSYCHOLOGICAL STATISTICS

Time : Three hours **Model Question paper** Maximum : 100 Marks

SECTION A – (10 X 1 = 10 marks)

Answer ALL questions.

1. The trend is linear if
   (a) Rate of growth is positive
   (b) Growth rate is constant
   (c) Growth rate is not constant
   (d) Technological growth.
2. The most important factor causing seasonal variation is
   (a) Depression in business
   (b) Growth of population
   (c) Whether and social customs
   (d) Flood and lock outs.
3. The average which has no bias with reference to the construction of index number is
   (a) Arithmetic mean (b) Geometric mean
   (c) Quadratic mean (d) Harmonic mean.
4. Index number calculation by fixed base method uses
   (a) an abnormal year (b) normal year
   (c) only leap year (d) non – leap year.

5. The geometric mean of Laspyre index and Paasche's index is
   (a) Bowley's index number
   (b) Marshall – Edgeworth Index number
   (c) Fisher's Index number
   (d) Kelly's index number.
6. The cost of living index is usually used for fixing
   (a) salary
   (b) dearness allowances
   (c) bonus
   (d) gratuity.
7. For percentiles, the total number of partition value are
   (a) 10 (b) 59
   (c) 100 (d) 99.
8. Psychological scale is
   (a) an interval scale (b) a ratio scale
   (c) both (a) and (b) (d) none of these.
9. Index of reliability is
   (a) square root of coefficient of reliability
   (b) square of coefficient of reliability
   (c) the ratio of the coefficient of two reliabilities
   (d) square root of the ratio of coefficient of two reliability.
10. By lengthening the test, the validity
   (a) increases (b) do not change
   (c) decreases (d) none of these.

SECTION B – (5 X 6 = 30 marks)

Answer ALL questions

All questions carry equal marks

11. (a) Mention the utility of a time Series

Or

(b) Explain the method of moving averages.4

12. (a) Distinguish between chain base method and fixed base method.

Or

(b) Mention the uses of index number.

13. (a) What is Fisher's Ideal Index? Why is it called ideal?

Or

(b) What do you understand by cost of living index num ber ?

14. (a) Bring out the uses of percentile ranking in the comparison of examination score.

Or

(b) What is meant by the standardization of intelligence tests ? Explain any one method for the same.

15. (a)What is meant by validity of measurements? How it is related to reliability?

Or

(b) Explain how Spearman's rank difference is used in item validity.

SECTION C – (5 X 12= 60 marks)

Answer ALL questions

All questions carry equal marks

16. (a) What are the components of a time series? Explain.

Or

(b) The annual production of a commodity is given as follows:

Year :	1990	1991	1992	1993	1994	1995	1996
Production : (in tonnes) :	70	80	90	95	102	110	115

Fit a straight line trend by the method of least squares.

17. (a) What are the important points which have to be considered in the construction of index numbers? Explain.

Or

(b) What are index numbers? What are the limitations of the fixed base index numbers?

18. (a) Explain the time reversal test and factor reversal test. Examine whether Laspeyre's and Paasche's index number satisfy these tests.

Or

(b) What are the uses of cost of living index numbers?

19. (a) Describing scaling of rating through Normal curve.

Or

(b) Describe the method to measure an IQ.

20. (a) Explain any two concepts of validity.

Or

(b) Explain Tetrachoric correlation.

Third Semester

Part III-Branch II-Statistics

Core paper IV: DEMOGRAPHIC METHODS

Time: Three hours **Model question paper** Maximum: 100 marks

Answer ALL Questions.

SECTION A-(10x1=10 marks)

Choose the **best** Answer

1. Complete count of the people of a county is known as
   a) Demography b) Census
   c) Vital statistics d) None of these
2. Sampling registration system of births and deaths in urban areas was started in the year
   a) 1947 b) 1950 c) 1968 d) 1967
3. Age specific fertility rate curve is
   a) Bell shaped b) Bowl shaped
   c) St. line c) Irregular shaped
4. Net reproduction rate ranges between
   a) $-\infty$ to $+\infty$ b) 0 to 5 c) 0 to 1 d) 0 to ∞
5. The death rate due to child birth among the women is known as
   a) Crude death rate b) infant mortality rate
   c) Maternal mortality rate d) crude birth rate
6. Infant mortality rate is an example for

a) Fertility rate b) Crude birth rate
c) Crude death rate d) Age specific death rate

7. In a q_x is equal to
a) d_x / l_x b) l_x / d_x
c) $l_x d_x$ d) $l_x - d_x$.

8. A life table constructed for an age interval of 5 to 10 years is specifically known as
a) Growth life table b) interval table
c) abridged life table d) life table.

9. The ratio of births to deaths in a year is called
a) vital index b) fertility
c) mortality d) population growth

10. The suitable curve for population growth is
a) parabolic curve b) exponential curve
c) logistic curve d) all the above.

SECTION – (5x6=30 marks)
Answer all questions
All questions carry equal marks

11. (a) What are demographic surveys?
Or
(b) What are the draw backs of registration of vital statistics in India?

12. (a) Define age specific fertility rate.
Or
(b) Explain net reproduction rate.

13. (a)Define Infant mortality rate and maternal mortality rate.
Or
(b) Define Standardized death rate

14. (a) What is a life table? Write down any three uses of life table
Or
(b) Write down the factors responsible for migration.

15. (a) Explain the concept of population projection
Or
(b) Obtain logistic curve and state its limitations.

SECTION – (5x12=60 marls)

16. (a) Explain the salient features of census
Or
(b) Explain the secondary sources of Demographic data.

17. (a) Write down the factors which affect fertility.
Or
(b) Define
i. Curve birth rate
ii. Total fertility rate
iii. Gross reproduction rate

18. (a) Define various specific death rates.
Or
(b) Describe the importance of Makeham law of mortality

19. (a) Describe the construction of various columns of a life table

Or

(b) Explain the meaning of migration. Describe any two different kinds of migration.

20. (a) Write notes on:

Third Semester
Part – III Statistics
Core paper-V:Probability and Distributions – I

Time: 3 hours **Model question paper** Maximum: 100 marks

Section A (10 x 1 = 10 marks)
Answer ALL questions

1. For a random variable X, F(x) = p(X≤x) is
a) pdf b)pmf c) df d) none of these

2. If F(x) = P(X≤x) then P (a ≤ X ≤b) is
a) F(b)-F(a) b) F(b)+F(a) c)F(a)-F(b) d) none of these

3. If X and Y are independent random variables, then f(x,y)=
a) f(x) b) f(y) c) f(x) f(y) d) f(x)/f(y)

4. If f(x,y)=cxy **,** 0≤ X ≤4 1≤Y≤5 then the value of c is
a) 1/100 b)1/96 c) 1/48 d) 96

5. If X and Y are two random variables, then E(aX+bY) =
a) E(X)+ E(Y) b)) aE(X)+ bE(Y) c)) E(X)+ bE(Y) d)) aE(X)+ E(Y)

6. V(X) is equal to
a) $E(X) – E(X^2)$ b) $E(X) – (E(X^2))^2$ c) $E(X^2) – E(X)$ d) $E(X^2)$

7. Cumulant generating function is equal to
a) log Mx(t) b) 1/ log Mx(t) c) log 1/ Mx(t) d) Mx(1/t)

8 $\phi_x(t)$ is equal to
a) $E(e^{itX})$ b) $E(e^{tX})$ c) E(tX) d) $_eE(^{itX})$

9. Weak law of large numbers is associated with
a) Converge in probability b) number theory c) convergence in series d) none of these.

10 the distribution associated in Central limit theorem is
a) Normal distribution b) Poisson distribution c) Gamma distribution d) F distribution

Section B (5 x 6 = 30 marks)
Answer ALL questions
All questions carry EQUAL marks

11. A random variable X has the following probability function

x :	0	1	2	3	4	5	6	7
f(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

i) Find k
ii) Evaluate $P(X<6)$, $p(X\geq 6)$ and $p(0<X5)$

or

b) Define random variable and distribution function

12.a) Joint probability distribution of the random variable X and Y is given by
$P(X=0,Y=1)=1/3, P(x=1,Y=-1)=1/3, P(X=1,Y=1)=1/3$
find the marginal distribution of X and Y.

or

b).the joint p.d.f of (X,Y) is $f(x,y)=2\, e^{-(x+y)}$, $0\leq y \leq x < \propto$
$= 0$ elsewhere
find the marginal density function of Y

13. a)Prove that $E(X)=E(E(X/Y))$

or

b) State and prove addition theorem of mathematical expectation.

14.a) Define the m.g.f of random variable .show that the m.g.f of sum of two random variables is
equal to product to their m.g.f's.

b) write the properties of characteristic function.

15.a) state and prove weak law of large numbers.

or

b). Define converge in probability..

Section C (5 x12 = 60 marks)
Answer ALL questions
All questions equal marks

16. a)If $f(x)=6x(1-x)$, $0\leq x \leq 1$,then show that
i) f(x)is a pd.f
ii) Determine median
iii) Find mean and variance.

Or

b) given X is a continuous random variable with p.d.f

$$f(x) = \begin{cases} ax, & 0\leq x \leq 1 \\ a, & 1\leq x \leq 2 \\ -ax+3a, & 2\leq x \leq 3 \end{cases}$$

= otherwise

17. a) If joint distribution Function of X and Y is

$F(x,y)=1-e^{-x}- e^{-x}+ e^{-(x+y)}$, $X>0,Y>0$

=, otherwise

Find

i) joint pdj (X,Y)

ii) $P(X\leq 1\cap Y\leq 1)$ and $P(X+ Y\leq 1)$

or

b) Explain in detail the transformation one dimensional and two dimensional randomvariables.

18.a) State and prove multiplication theorem on expectation

or

b) A coin is tossed until a head appears .what is the expectsaion of number of tosses required?

19. a) Define mgf . Also state and prove any three its properties .

or

b) obtain the relation between cumulants and moments for first four cumulants

20 a) state and prove central limt theorem

or

b) state and prove chybychev's inequality.

B.Sc DEGREE EXAMINATION

Fourth Semester

Part – III Statistics

Core paper-VI: Probability and Distributions – II

Time: 3 hours **Model question paper** Maximum: 100 marks

Section A (10 x 1 = 10 marks)

Answer all questions

Choose the BEST answer

1. In Binomial distribution the mean and variance has the relation

   a). Mean >Variance b). Mean < Variance

   c). Mean > Variance d). Mean = Variance

2. In a Poission distribution, the mean value is 5 then the value of the variance

   a). 25 b). $\sqrt{5}$

   c). 125 d). 5

3. In Negative Binomial distribution the relation between mean and variance is

   a). Mean < Variance b) Mean > Variance
   c) Mean = Variance d). None of the above

4. _____ distribution lacks memory
   a). Geometric b). Hyper geometric
   c). Poisson d). Multinomial

5. The area under the standard normal curve beyond the under z = 1± .96 is
   a). 95% b). 5% c). 90% d). 10%

6. Q.D of normal distribution is
   a). $\frac{4}{5}\sigma$ b). $\frac{5}{4}\sigma$ c). $\frac{2}{3}\sigma$ d). $\frac{3}{2}\sigma$

7. The m.g.f of Gamma distribution is
   a). $(1-t)^{-\lambda}$ b). $(1-t)^{-\lambda}$ c). $(1-t)^{\lambda}$ d). $(1+t)^{\lambda}$

8. The value of $\beta\left(\frac{1}{2},\frac{1}{2}\right)$ is
   a). Π b). $\sqrt{\Pi}$
   c). $\frac{\Pi}{2}$ d). $\sqrt{\frac{\Pi}{2}}$

9. The range for χ^2 variable is
   a). $(-\alpha,\alpha)$ b). $(0,\alpha)$
   c). $(-\alpha,0)$ c). $(0,n)$

10. In F distribution
    a). Mean > Mode b). Mean <Mode
    c). Mean = Mode d). None of these

Section B (5 x 6 = 30 marks)
Answer all questions
All questions equal marks

11. a) . Derive Binomial distribution
    or
    b). Find mean and variance of Poisson distribution

12. a). Find mean and variance of Geometric distribution
    or
    b). Find the mean value of multinomial distribution

13. a). Derive mean and variance of Normal distribution

or

b). Find the m.g.f of Normal distribution

14. a). Define Gamma variate. Establish the addition property of Gamma distribution

or

b). Find mean and variance of exponential distribution

15. a). Derive the m.g.f of a χ^2 variate

or

b). Establish the relationship between t and F variates.

Section – C (5 x 12 = 60 marks)
Answer ALL questions
All questions EQUAL marks

16. a). Derive Poisson distribution. Also find the rth order moment

Or

b). Define Geometric distribution. Derive m.g.f of the distribution.

17. a). Find mean and variance for Hyper geometric distribution

Or

b). Find mean and variance of Negative Binomial distribution. Also state the conditions when negative Binomial tends to Binomial distribution

18. a). State the main characteristics of Normal distribution

Or

b). Find the m.g.f Normal distribution. Hence otherwise find the first four moments

19. a). Define the two types of Beta distribution. Also find μ'_r for Beta] distribution of first kind.

Or

b). Find the moments of Gamma distribution

20. a). Derive student's t – distribution

Or

b). If χ_1^2 and χ_2^2 are two χ^2 independent variates with n_1 and n_2 d, f respectively then find the distribution of χ_1^2/χ_2^2

B.Sc DEGREE EXAMINATION
Fifth Semester
Part – III Statistics
Core paper VII: STATISTICAL INFERENCE – I

Time: 3 hours **Model question paper** Maximum: 100 marks

Section A (10 x 1 = 10 marks)
Answer ALL questions

1. The distribution of statistics is called
   a). Probability distribution b). Sampling distribution
   c). Normal distribution d). Poisson distribution

2. The Standard error of the median of a sample of size n form N (M, σ^2) is
   a) $\sqrt{\frac{\sigma^2}{n}}$ b). $\sqrt{\frac{\sigma}{n}\frac{2}{\prod}}$ c). $\frac{2\prod}{3}\frac{\sigma^2}{n}$ d). $\frac{6}{\sqrt{n}}\frac{\sqrt{\prod}}{2}$

3. An estimator T is said to be positively biased for θ if
   a). θ - E (T) >0 b). θ - E (T) < 0
   c). θ - E (T) = 0 d). θ - E(T) ≠ o

4. Rao – Blackwell theorem enables us to obtain MV UE through
   a). Sufficient estimator b). Consistent estimator
   c) Efficient estimator d) Unbiased estimator

5. Estimators obtained by the method of moments are
   a). Unbiased b).Consistent c).Efficient d).Sufficient

6. The MLE of σ^2, where σ^2 is the variance a normal population with unknown m is for I = 1,2,……..n,
   a). $\sum(xi - x)^2/(n-1)$ b). $\sum(xi - \mu)^2/(n-1)$ c). $\sum(xi - X)^2 n$ d). $\sum(x_i - \mu)^2/n$

7. 't' distribution is considered in interval estimation to find out confidence limits for
   a). Variance b).Standard Error c).Population Mean d). σ_1^2/σ_2^2

8. χ^2 distribution is used in interval estimation to find out confidence limits for a
   a.population Variance b) Correlation coefficient c) Mean d) σ_1^2/σ_2^2

9. The range of multiple correlation coefficient is
   a) -1 to +1 b) 0 to +1 c) 0 to -1 d) $-\infty to +\infty$

10. If r_{12} = 0, r_{13}=0, then R1.23 is
    a). 0 b). 1 c). -1 d). 2

Section B (5 x 6 = 30 marks)
Answer ALL questions
All questions carry EQUAL marks

11 a) Explain the concept of statistical inference

Or

b) Define standard error. Derive the expression for the standard error of proportion

12. a. Show that $S^2 = \frac{1}{\Sigma}(x-\bar{x})^2$ is not an unbiased estimator of σ^2

Or

b. State and prove Rao – Blackwell theorem

13. a. Explain the method of maximum likely-hood estimator

Or

b. What are the properties of MLE

14. a. What are the differences between point and interval estimation. Derive 100 (1-α) % confidence limits for mean when sample size is small

Or

b. Derive the formula for partial correlation coefficient $r_{12.3}$ for three variables

15. a. Prove that sample mean is consistent estimator of population mean when x_1, x_2, …..x_n follows $N(M,\sigma 2)$

Or

b. Find out R 1.23 and r_{23}.1 when r_{12} = 02.2 r_{23} =0.3 and r_{31} = 0.4

SECTION – C (5 x 12 = 60 marks)
Answer ALL questions
All questions carry EQUAL marks

16 a) Explain parametric estimation. Derive standard error of differences between two means

Or

b) Explain sampling distribution and derive the standard error of difference between two proportions

17. a) If θ is an unbiased estimator of θ and if E (θn) = θ as $n \longrightarrow \infty$, then θn is consistent for θ. prove

Or

b) Describe the method of moments. Find out the estimator of mean of a poisson distribution and proportion of a Binomial distribution by using method of moments

18. a. State and prove Cramer – Rao inequality

Or

b. Explain the method of minimum chi square. Also mention the properties of minimum chi –square

19. Derive 100 $(1-\alpha)$% confidence limits for

(i) Variance when $N \leq 30$ and (ii) difference between two means when samples are drawn from normal populations with known variances.

Or

b. Obtain multiple linear regression equation of X1 on X2 and X3.

20. a. Prove that sample mean is a sufficient and maximum likelihood estimator of population mean when x1, x2, …..xn ~ N (μ s^2)

Or

b. Find out $R_{2.31}$ and $r_{23.1}$ for the following data

x_1:	2	5	7	9	8	10
x_2:	7	5	9	10	11	12
x_3:	4 8	12	15	10	16	

B.SC DEGREE EXAMINATION

Fifth Semester

Part III-Branch II- Statistics

Core paper-VIII:BASIC SAMPLING THEORY

Time: Three Hours Model question paper Maximum: 100 Marks

Section A – (10x1=10)

Answer ALL the questions

Choose the best answer

1. The number of possible simple random samples of size *n* from a population of *N* units with replacement is

(a) N^2 (b) n^2

(c) $\propto$ (d) N!.

2. Probability of drawing a unit at each selection remains same in

(a) SRSWOR (b) SRSWR

(c) Both (a) and (b) (d) Neither (a) and (b)

3. Under proportional allocation, the size of the sample from each stratum depends on

(a) Total sample size (b) Size of the stratum

(c) Population size (d) All the above

4. Gain in efficiency stratified random sampling over SRSWOR due to optimum allocation is

(a) $(V(\bar{y}_n)_R - V(\bar{y}_{st})_N) / V(\bar{y}_n)_R$

(b) $(V(\bar{y}_{st}) - V(\bar{y}_n)_R)/ V(\bar{y}_{st})_N$

(c) $(V(\bar{y}_n)_R - V(\bar{y}_{st})_N)/ V(\bar{y}_n)_N$

(d) None of these

5. A sample in which only the first unit is selected at random is known as

(a) Simple random sample

(b) Stratified random sample

(c) Systematic sample

(d) Cluster Sample

6. In systematic sampling the value of V (--------

(a) (b) (c) (d)

7. Two stage sampling design is more efficient than single stage sampling if the correlation between units in the first stage is

(a) Negative (b) Positive

(c) Zero (d) 1.

8. In Cluster sampling the units are

(a) Overlapping (b) Non-overlapping

(c) Homogeneous (d) Non-Homogeneous.

9. Non-sampling errors arise due to

a) Faulty planning (b) Poor response (c) Improper coverage (d) All of the above

10. Non-response in survey means:

(a) Non-availability of respondents

(b) Non- return of questionnaire by the respondents

(c) Refusal to give information by the respondents

(d) All of the above

SECTION B- (5 x 6 = 30 Marks)

Answer ALL questions.

All questions carry EQUALl marks

11. (a) What is finite population correction and sampling fraction?

Or

(b) Differentiate between SRSWR and SRSWOR.

12. (a) What is stratification? When it is useful?

Or

(b) State the advantages and disadvantages of stratified random sampling.

13. (a) What is systematic sampling? What are the merits and demerits of systematic sampling?

Or

(b) Explain circular systematic sampling.

14. (a) Describe cluster sampling and in what situations the cluster sampling be preferred?

Or

(b) Distinguish cluster and two-stage sampling. State main ad vantages of two stage sampling.

15. (a) What are sampling errors? Explain the caused for getting such errors in sampling?

Or

(b) Distinguish between questionnaire and schedule.

SECTION C- (5 X 12 =60 marks)

Answer ALL questions

All questions carry EQUAL marks

16. (a) Derive an unbiased estimator for population mean in sample random sampling without replacement. Obtain its standard error.

Or

(b) Discuss any one method of drawing simple random (b) Discuss any one method of

drawing simple random sample without replacement.

17. (a) In stratified random sampling with usual notations, prove that $v_{opt} \leq v_{prop} \leq v_{ran}$ ignoring

finite population correction terms.

Or

(b) What is proportional allocation? Show that in proportional allocations, $V(\bar{y}_{st})_{prop} = ((N-n)/N\,n)\sum(N_i/N)\,S_i^2$

18. (a) Show that in systematic sampling with interval 'k' the sample mean is unbiased for the

population mean.

Or

(b) In a systematic sampling derive an expression for the variance of sample mean in terms of intra-class correlation coefficient.

19. (a) Derive an expression for the optimum cluster size by using suitable cost function.

Or

(b) Obtain an unbiased estimate of variance of the estimate of the population mean under two stage sampling.

20. (a) Explain non-sampling errors. What are the different sources of non-sampling errors?

Or

(b) Describe how will you organize and conduct a sample survey to study the problem of child labour in Tamil Nadu.

B.SC DEGREE EXAMINATION, NOVEMBER 2007.
FIFTH SEMESTER
Part III – Branch II- Statistics
Core paper-IX: DESIGN OF EXPERIMENTS

Time : Three Hours **Model question paper** Maximum : 100 Marks

Section A – (10x1=10marks)
Answer ALL the questions
Choose the BEST answer**.**

1. If $C = \sum l_i y_i$ is a linear combination of the observation, it is called contrast. If
(a) $\sum li = 0$ (b) $\sum li > 0$
(c) $\sum li = 1$ (d) $\sum li < 0$
2. Consider the linear model $y_{ij} = \mu + \alpha_i + \beta_j + e_{ij}$, the distribution of eij, usually
(a) $N(0, \sigma_e^2)$ (b) N (1,1)
(c) N (0,1) (d) N (0,0)
3. Local control is used for reducing the
(a) Treatment effect
(b) Error variation
(c) Heterogeneity of plots
(d) Efficiency
4. The empirical relationship between the plot size and plot variance is
(a) $Vx = \frac{V_1}{X^b}$ (b) $V_1 = \frac{Vx}{X^b}$
(c) $Vx = \frac{X^b}{V_1}$ (d) $V_1 = \frac{X^b}{V_X}$
5. The model $y_{ij} = \mu + \alpha_i + \beta_j + e_{ijk}$ is used in
(a) CRD (b) RBD
(c) LSD (d) None of these.
6. In a Latin square design with 5 treatments, the error digress of freedom is
(a) 4 (b) 12
(c) 16 (d) 25
7. Formula for estimating a missing value is RBD with *r* blocks and *t*- treatments is

$(a)\ \dfrac{rB+tT-S}{(r-1)(t-1)}$

$(b)\ \dfrac{(r-1)B+tT-2S}{(r-1)(t-1)}$

$(c)\ \dfrac{(r-1)B+(t-1)T-S}{(r-1)(t-1)}$

$(d)\ \dfrac{rB+tT-2S}{(r-1)(t-1)}$

8. The error degrees of freedom in a LSD when 2 values are missing with 4 treatments is,
(a) 5 (b) 6
(c) 4 (d) 3.

9. In a 2^2 factorial experiments, the first order interaction between the factors A and B is written in

$(a)\frac{1}{2}\{(1)+(a)-(b)-(ab)\}$

$(b)\frac{1}{2}\{(1)-(a)+(b)-(ab)\}$

$(c)\frac{1}{2}\{(1)-(a)-(b)+(ab)\}$

$(d)\frac{1}{2}\{(1)+(a)+(b)-(ab)\}$

10. If different effects are confounded in different blocks, it is said to be,
(a) Complete confounding
(b) Partial confounding
(c) Balanced confounding
(d) Partially balanced confounding

SECTION B- (5x6=30Marks)
Answer ALL the questions.
All questions carry EQUAL marks

11. (a) What is linear design model? Explain with suitable examples.

Or

(b) Explain how the least square method is used to estimate the parameters of a linear model.

12. (a) Explain experimental units and experimental error.

Or

(b) Explain Fair-field Smith's variance law in determination of size of the plot.

13. (a) Define CRD. State its advantages.

Or

(b) Compare the efficiency of RBD over CRD.

14. (a) Explain the method of estimating one missing value on RBD.

Or

(b) Explain analysis of covariance

15. (a) Explain how the main effects and interaction effect are derived in a 2^2 factorial experiment.

Or

(b) What is meant by confounding in factorial designs? Mention is advantages.

SECTION C- (5x8=40)

Answer ALL the questions.

All questions carry EQual marks

16. (a) What is analysis of variance? State the basic assumptions in ANOVA. Give the model and ANOVA Table for one-way classification

Or

(b) Give the complete statistical analysis for two-way classification with one observation per cell.

17. (a) Explain the principles of Randomization, Replication and local control.

Or

(b) Write a detailed note on uniformity trails.

18. (a) Stating the basic model, explain the analysis of data obtained from a RBD.

Or

(b) Describe the analysis of data obtained from LSD.

19. (a) Explain how two missing values are estimated in a LSD. Also give the ANOVA table.

Or

(b) Explain how the missing plot technique is used t estimate the two missing values in a RBD. Give ANOVA table

20. (a) Define the main effects and interaction effects in a 3^2 factorial experiment. Also give its ANOVA table

(OR)

(b) Discuss the following in detail with suitable examples.

(i) Total Confounding and

(ii) Partial Confounding

B.Sc. DEGREE EXANMINATION

Sixth Semester

Branch II--Part III--Statistics

Core paper- X: STATISTICAL INFERENCE - II

Time: Three hours **Model question paper** Maximum: 100 marks

SECTION A-(10 x 1 = 10 marks)
Answer ALL the questions.
Choose the correct answer

1. For large samples t-distribution tends to
(a) x^2 distribution
(b) F-distribution
(c) Normal distribution
(d) Fisher's Z-distribution

2. Let $X_1, X_2, \ldots X_n$ be a random sample from $N(\mu, \sigma^2)$ (μls known). Then the statistic X^2

$$= \frac{\sum_{i:1}^{n} (Xi - \bar{X})^2}{\sigma^2}$$ follows

(a) χ^2_{n-1} (b) χ^2_{n-2}
(c) $F_{(n-1,\, n-1)}$ (d) t_{n-1}

3. Degree of freedom for the X^2 statistic in case of contingency table of order 4 x 3 is
(a) 4 (b) 5
(c) 6 (d) 3

4. $\sum_{i:1}^{K} \frac{(Oi\text{-}Ei)^2}{Ei}$ is simplified as

(a) $\sum_{i:1}^{K} \frac{Oi}{Ei} - 2N$ (b) $\sum_{i:1}^{K} \frac{Oi^2}{Ei} - N$

(c) $\sum_{i:1}^{K} \frac{Oi^2}{Ei} + N$ (d) $\sum_{i:1}^{K} \frac{Oi^2}{Ei} - 2N$

5. Type I error is defined as
(a) Reject H_0 is true (b) Reject H_0 when H_0 is false
(c) Accept H_0 when H_0 is true (d) Accept H_0 when H_0 is false

6. Testing $H_0 : \theta = 10$ against $H_1 : \theta > 10$ leads to
(a) One sided left tailed test (b) One sided right tailed test
(c) Two sided test (d) All the above.

7. With usual notations the condition for unbiased test is

(a) $\sup_{0 \in \theta_0} P_T(\theta) \leq \inf_{0 \in \theta_1} P_T(\theta)$

(b) $\sup_{0 \in \theta_0} P_T(\theta) \geq \inf_{0 \in \theta_1} P_T(\theta)$

(c) $\sup_{0 \in \theta_0} P_T(\theta) = \inf_{0 \in \theta_1} P_T(\theta)$

(d) None of the above.

8. LR test is
(a) Unbiased (b) Sufficient
(c) Consistent (d) Efficient

9. Run test is used for
(a) Testing equality of means (b) Testing equality of variances
(c) Testing equality of distributions (d) Testing equality of Medians.

10. $\frac{2n_1n_2}{n_1 + n_2} + 1$ is the mean of
(a) Sign test (b) Run test
(c) Median test (d) U-test

SECTION B- (5 x 6 = 30 marks)
Answer ALL the questions.
All question carry EQUAL marks

11. (a) What is meant by Standard error? Bring out its used in test of significance.
Or
(b) How will you test whether two population means are same based on large samples?

12. (a) What is contingency table? Explain its used.
Or
(b) Explain the test for homogeneity of several independent population variances.

13. (a) Explain the following terms:
(i) Null and alternative hypothesis
(ii) Best Critical region
(iii) Simple and Composite hypothesis.
Or
(b) What are the possible errors in hypothesis testing? In what way they are related to the critical region?

14. (a) Explain the unbiased test based on F-distribution.
Or
(b) Explain the general procedure of LRT.

15. (a) What are the advantages of non-parametric test, if it exists?
Or
(b) Describe the run test for a Single Sample Problem.

SECTION C--(5 x 8 = 40 marks)
Answer ALL the questions.

16. (a) Two random samples drawn from two normal populations are
Sample I: 20,16,26,27,23,22,18,24,25,19
Sample II: 27,33,42,42,35,32,34,38,28,41,43,30,37.
Test whether the two populations have the same variances.
Or
(b) Specify the test statistic and the testing procedure to testing the significance of observed simple correlation coefficient and multiple correlation coefficients.

17. (a) (i) Explain the uses of χ^2 test.
(ii) Describe the χ^2 test for goodness of fit.
Or
(b) (i) Explain the concept of degrees of freedom.
(ii) 210 students were classified according to their intelligence and economic conditions. Test whether there is any association between intelligence and economic conditions.

	Intelligent	Not Intelligent
Economic condition good	44	66
Economic condition not good	32	68

18. (a) State and Prove Neyman-Pearson Lemma.

Or

(b) Use Neyman-Pearson Lemma to find the most powerful level 2 - test for testing the hypothesisH_0: $\boldsymbol{\theta} = \boldsymbol{\theta}_0$ against H_1 : $\boldsymbol{\theta} = \boldsymbol{\theta}_1 (> \boldsymbol{\theta}_0)$ based on a sample of size n from $N(\mathbf{0,4})$.

19. (a) Derive the likelihood Ratio test of equality of means of two normal populations.

Or

(b) Let $X_1, X_2, \ldots\ldots X_n$ be a random sample from $N(0,\theta)$. Obtain UMP test for H_0 : $\boldsymbol{\theta} = \boldsymbol{\theta}_0$ against H_1 : $\boldsymbol{\theta} < \boldsymbol{\theta}_0$. Also derive the power function of the test.

20. (a) Describe Median test for two sample problems.

Or

(b) Explain Mann-Whitney 'U' test.

B. Sc. DEGREE EXAMINATION

Part III -- Branch II -- Statistics

Core Paper –XI: STATISTICAL QUALITY CONTROL

Time: Three hours **Model question paper** Maximum: 100 marks

SECTION A-(10 x 1 = 10 marks)

Answer ALL questions

Choose the best answer.

1. Variations in the quality of manufactured product are broadly classified into_____ causes

   a) chance causes b) assignable causes c) both of them d) none of these

2. Upper control limit for C-chart is

   a) $\bar{c} + 3\sqrt{\bar{c}}$ b) $\bar{c} - 3\sqrt{\bar{c}}$ c) $\bar{c}-\sqrt{c}$ d) none of these

3. ASN for double sampling plan is

   a) $n_1 + n_2(1-P_1)$ b) $N + n_2(1-P_1)$ c) $n_2(1-P_1)$ d) none of these

4. In sequential sampling plan, sampling inspection will be continuing by taking additional observation when

   a) $a_m > d_m > r_m$ b) $a_m < d_m < r_m$ c) $a_m = d_m$ d) none of theses

5. ISO stands for _____

6. Principles pf TQM is broadly into_____ elements

a) 5 b) 4 c) 3 d) 1

7. CUSUM stands for _____

8. ARL stands for _____

9. Reliability function for one parameter exponential distribution is_____

10. Reliability function for weibull distribution is_____

Section B (5 x 6 = 30 marks)
Answer ALL questions
All questions carry EQUAL marks

11.a) what do you understand by statistical Quality Control?
Or
b) Explain the usefulness of R-chart.

12 a) Describe single sampling plan for attributes.
Or
b) Draw OC curve for double sampling plan.

13.a) Explain the benefits of ISO 9000.
Or
b) Explain TQM concept briefly.

14.a) Explain the procedure for constructing control limits of group control chart.
Or
b)Explain CUSUM chart.

15. a) Explain IFR and DFR
Or
b)Derive $\mu(t)$ for parameter exponential distribution .

Section C (5 x 12 = 60 marks)
Answer ALL questions
All questions carry EQUAL marks

16.a)Explain in detail the $\bar{x}$ chart and R charts. What purposes they serve?
Or
b) Explain the statistical basis and construction of p and np charts. How is the choice between p and np charts made?

17.a) Derive OC and ATI curves single sampling plan for attributes.
Or
b) Describe Wald's SPRT plan. Derive OC and ASN function of such plan with specified p_1 p_2 , α and β.

18.a) Distinguish between shewhart control chart and CUSUM chart. What are the uses of ARL control chart?

Or

b) Explain causes of variation in Quality. Describe the operating characteristic curve for a control Chart.

19. a) Explain the principle elements of TQM.

Or

b) Explain the salient features of ISO-9000 series standards.

20a) Derive a reliability function and hazard rate for gamma distribution.

Or

b) Derive a reliability function and hazard rate for weibull distribution.

B.Sc. DEGREE EXAMINATION
Second Semester
Part III—Branch II—Statistics
Core practical I: Descriptive Statistics-I & II

Time: 3 hours **Model question paper** Maximum: 100 marks

Answer any THREE questions
All questions carry equal marks

1. For the following data find the mean, variance, standard deviation, median, minimum and maximum

Height	**Weight**	**Height**	**Weight**
135	26	133	31
146	33	149	34
153	55	141	32
154	50	164	47
139	32	146	37
131	25	149	46
149	44	147	36
137	31	152	47
143	36	140	33
146	35	143	42
141	28	148	32
136	28	149	32
154	36	141	29
151	48	137	34
155	36	135	30

2. Sort the **SEX** variable in ascending order and find the frequency distribution for Wrist diameter with Class interval ranging from <=5, 6-8, 9-11, >=12

Wrist diameter	**Sex**
10.4	1
11.8	1
1.9	1
12.2	1
9.6	1
11.5	1
2.5	0
8.9	0
11.2	0
12	0
10.4	0
6.7	0
1.3	0
10.3	0
10.6	1
11.1	1
1.9	0
5.2	1
12.2	0

3. Using an appropriate method, compute an index number for the following data

Commodity	Quantities		price	
	1978	1980	1978	1980
A	40	42	1.72	1.98
B	45	78	1.56	1.85
C	46	37	1.96	1.68
D	56	49	2.33	1.98
E	43	50	2.56	2.68

4. Draw a multiple bar diagram for the following data

Year	Sales (‘000 Rs)	Gross Profit (‘000 Rs)	Net Profit (‘000 Rs)
1974	100	30	10
1975	120	40	15
1976	130	45	25
1977	150	50	25

5. Obtain the regression equation of Y on X for the following data

Age in years (X)	Blood pressure (Y)
56	147
42	125
72	160
36	118
63	149
47	128
55	150
49	145
38	115
42	140
68	152
60	155

B.Sc., DEGREE EXAMINATION
PART III – Statistics
Allied II : paper-I: Computer programming for Statistical analysis -I
(C – Programming)

Time: Three hours **Model question paper** Maximum: 75 Marks

SECTION A – (10 X 1 = 10 marks)
Answer ALL questions.
Choose the best answer

1. A constant having a decimal point is declared as
   (a) int (b) float
   (c) char (d) none of these.
2. Which of the following is not a type declaration?
   (a) short (b) long
   (c) medium (d) double.
3. Which of the following is a binary operator ?
   (a) - - (b) +
   (c) + + (d) none of these.
4. Which of the following is a valid assignment statement ?
   (a) y = = x (b) ++y = ++x
   (c) ++y = x (d) y = ++x.
5. Which of the following is a looping statement?
   (a) switch statement (b) # define statement
   (c) for statement (d) none of these.
6. The statement which causes transfer of control to the calling portion of the function is
   (a) stop (b) continue
   (c) return (d) none of these.
7. In an array the number of elements are represented in
   (a) Square brackets (b) Curved brackets
   (c) Both of these (d) None of these.
8. Which one of the following is a pointer variable?
   (a) int .. u ; (b) int pu* ;
   (c) +float u* ; (d) int *pu ;
9. The key word used to define a structure is
   (a) structure (b) int struct
   (c) struct (d) none of these.
10. The function fopen ( ) is used to
    (a) To open a file (b) To close a file.
    (c) To modify a file (d) To delete a file

SECTION B – (5 x 5 = 25 marks)
Answer all questions
All questions carry equal marks

11. (a) What is an expression? State its components?

Or

(b) Describe data types available in C.

12. (a) Describe the two logical operators used in C.

Or

(b) Explain the commonly used input functions in C.

13. (a) Describe the general form of for loop. Give an example.

Or

(b) Explain the general form of if – else statement.

14. (a) Summarize the rules for using a two dimensional array.

Or

(b) Describe the role of pointers in C – language.

15. (a) What is the purpose of the function fclose ( ) in C?

Or

(b) Describe the procedure of creating a stream oriented data file.

SECTION C – (5 x 8 = 40 marks)

Answer ALL questions

All questions carry EQUAL marks

16. (a) Explain different data types constants used in C with examples.

Or

(b) What is a variable declaration? Describe its uses with example.

17. (a) Explain with examples the conditional operators available in C.

Or

(b) Describe printf ( ) and scanf ( ) functions.

18. (a) What is recursion? Using the same write a program to find the value of $\left(\frac{n}{r}\right)$

Or

(b) Describe the general form of while statement. Using the same give a set of inputs of n – values.

19. (a) How a function can be passed to another function using pointers?

Or

(b) What is an array in C? Describe its uses in C-language.

20. (a) Write a C-program to create and view data file consisting of three information of a student viz.,

(b) Using arrays write a C-program to find the mean of given n – values.

B.Sc., DEGREE EXAMINATION.

FOURTH SEMESTER

PART III – STATISTICS

Allied II : paper-II: Computer programming for Statistical analysis -II

(C ++ Programming)

Time: Three hours **Model question paper** Maximum: 75 Marks

SECTION A – (10 X 1 = 10 marks)
Answer ALL questions.
Choose the best answer

1. Tokens are
a).largest units b) Class c) smallest individual units d) none of the above

2. dynamic bindin g is also known as
a) temporary binding b) late binding c) static binding d) none of these

3.do while is an
a) input statement b) entry control loop statement
c) exit control loop statement d) unconditional loop statement
4. ---------- is a way to bind the data and the associated functions together
a) Class b) objects c) functions d) none of the above
5. An in line function is a request to the compiler which may be ignored.
The above statement is
a) true b) false
6. function over loading can be done when 1). argument types are different 2). number of arguments are different 3).return types are different
a). 1 only. b). 2 onlyc). 1 and 3 onlyd). 1 and 2 only.

7). Which among the following can be overloaded
1). Constructors 2). destructors
a) 1 only
b). 2 only
c). 1 and 2
d). none of the above

8). Operator overloading is
a). runtime polymorphism
b). compile time polymorphism
c).both
d). none of the above

9).a derived class with several base class is called ---------- inheritance
a). multilevel
b). multiple
c).hierarchial
d).single

10).---------- makes it possible to use one function or class to handle many different data types
a). Templates
b). exceptions
c). constructors

SECTION B – (5 x 5 = 25 marks)
Answer all questions
All questions carry equal marks

11.a) . Explain how normal functions take more time than inline functions and how inline functions work.

OR

b) Explain the two types of function overloading

12.a) Briefly explain the copy and parameterized constructors

OR

b) Define and write the rules of operator overloading.

13.a) Explain different forms of polymorphism

OR

b) Explain virtual functions

14 a) Write a program to find the factorial of a given number

OR

b) Write a program to write n numbers in a file

15 a).Explain do-while and while statement

OR

b) Explain concepts and benefits of OOP

SECTION C– (5 x 8 = 40 marks)
Answer all questions
All questions carry equal marks

16. a) Explain classes and objects with examples

OR

b) A finance company has announced several loans to its customers. The interest rates for each type of loan and their code s are given below:

LOAN TYPE	INTEREST RATE	CODE
J-Loan	8%	1
H-Loan	9%	2
E-Loan	5%	3

b) Write a program to calculate the total amount to be returned on the basis of the amount taken and the interest provided.

17. a) Explain the friend functions with suitable examples

OR

b) Write a program to find the nC_r value.

18.a) Explain the overloading of binary operators

OR

b)Write a program to read a positive integer and determine and print its equivalent binary value.

19. a) Discuss the different forms of inheritance

OR

b) Write short notes on a) virtual function

b) Abstract class

20. a) Explain class and function template with examples

OR

b) Write a program to copy the contents of one file into another

B.SC Degree Examination
Fifth Semester
Part – III – Statistics
A.O.S. Paper – I: Numerical Mathematics

Time: 3 Hours **Model Question paper** Maximum: 75 marks

Section A (10 x 1 = 10 marks)
Answer all questions
Choose the BEST answer

1. Relation between Δ and E is
   a). $\Delta = E + 1$ b). $\Delta = 1 - E$
   c). $\Delta = E - 1$ d). $\Delta = hE$

2. Backward difference operator ∇ is defined as
   a). $\nabla f(x) = f(x) + f(x-h)$
   b). $\nabla f(x) = f(x) - f(x-h)$
   c). $\nabla f(x) = f(x) - f(x+h)$
   a. $\nabla f(x) = f(x+h) - f(x)$

3. The backward difference formula is useful when u lies between
   a). 1 and 2 b).-1 and 0 c). 2 and 3 d) 0 and 1

4. Bessel's formula truncated after the third differences is the same as

_____ truncated after the second differences

a). Stirling's formula b). Gauss forward formula

c). Everett's formula d). Gauss backward formula

5. Which one of the following in the interpolation with unequal intervals?

a) .Newton's forward formula b).Newton's backward formula

c). Central difference formula d).Divided difference formula

6. Find the parabola of the form $y = ax^2 + bx + c$ passing through the points (0,0), (1,1) and (2,20)

a). $y = 9x^2 - 8x$ b). $y = 8x^2 - 9$

c). $y = 10x^2 - 9x$ d). $y = 9x^2 - 10x$

7. The formula used to find maximum value of x is

a). Newton's backward formula b). Newton's forward formula

c). Gauss backward formula d). Gauss forward formula

8. Error in the trapezoidal rule is of order

a). h^3 b). h^2 c). h d). h^4

9. The sum of the Eigen values of a matrix is equal to

a). The sum of diagonal elements of the matrix

b). The product of the diagonal elements

c). Determinant value of the matrix d).none of these

10. In Jagobis method the rotation matrix is

a). $\begin{pmatrix} Cos\theta & -Sin\theta \\ Sin\theta & Cos\theta \end{pmatrix}$ b). $\begin{pmatrix} Cos\theta & -Sin\theta \\ Sin\theta & -Cos\theta \end{pmatrix}$

c). $\begin{pmatrix} Sin\theta & -Cos\theta \\ Cos & -Sin\theta \end{pmatrix}$ d). $\begin{pmatrix} Sin\theta & -Cos\theta \\ Cos\theta & +Sin\theta \end{pmatrix}$

Section B (5 x 5 = 25 marks)

Answer all questions

All questions carry equal marks

11. a). Find the first term of the series whose second and subsequent terms are 8, 3,0,-1,0

or

b).The hourly declination of the moon on a day is given below. Find the declination at $3^m\ 35^m\ 15^s$ and 5^h

Hour	0	1	2	3	4
Declination	8° 29'	53.7" 8°	8°6'43.5"	7°55'6.1"	7°43'27.2"

Using Newton's backward interpolation formula

12. a). Apply Gauss forward formula to obtain f(x) at x = 3.5 from the table given below

x	2	3	4	5
f(x)	2.626	3.454	4.784	6.986

b). Using Stirling's formula find y (1.22)

x	1.0	1.1	1.2	1.3	1.4	1.5
y	0.8417	0.89121	0.93204	0.96356	0.98545	0.99749

x	1.6	1.7	1.8
y	0.99957	0.99385	0.97385

13. a). Find the value of $\Delta^2 x^2$ and $\Delta^2 x^3$ and hence find Δ^2 (ax +b) (x+d) and Δ^2 (ax+b) (cx+d) (ex+f)

Or

b). Using Lagrange's formula find y (9.5) given

x	7	8	9	10
y	3	1	1	9

14.a). Given the following data find y'(6) and the maximum value of y.

x	0	2	3	4	7	9
y	4	26	58	112	466	922

or

b). Derive Simpson's 1/3 rule for numerical integration.

15 a). Find the dominant Eigen value of A = $\begin{pmatrix} 12 \\ 34 \end{pmatrix}$

b). Solve for x and y given the equations

f (x,y) = x^2 + y -11 = 0 and g(x, y) = y^2 + x -7 = 0 assuming initial approximations x_0 = 3.5 y_0 = -1.8 using Newton Raph son method.

Section C (5 x 8 = 40 marks)
Answer all questions
All questions carry equal marks

16. a). From the following table of half – yearly premium for policies maturing at different ages estimate the premium of policy maturity at the age of 46 and 63 using Newton's forward and backward formulae

Age x	45	50	55	60	65

Premium y	114.84	96.16	83.32	74.48	68.48

b). Derive Newton's forward interpolation formula for equal intervals.

17. a). Derive Gauss interpolation formula

or

b). From the following table find y (35) by using Sirling's formula and Bessel's formulae

X	20	30	40	50
Y	312	439	346	243

18. a). Derive Lagrange's interpolation formula for unequal intervals.

or

b). (i) write the properties of divided differences

(ii) Using Newton's formula find f(x)

x	0	1	2	4	5	7
f(x)	0 0	-12	0	600	7308	

19. a). Find the value of θ given f(θ) = 03.887 where $f(\theta) = \int_0^{\theta} \frac{d\theta}{\sqrt{1-\frac{1}{2}\sin^{2\theta}}}$ using table

θ	21°	23°	25°
f(θ)	0.3706	0.4068	0.4433

or

b) Evaluate the integral I = $\int_4^{52} \log x dx$ using

i) Trapezoidal rule and ii) Simpson's rules

20 a). Explain Jacobi method of finding Eigen values of 2 x 2 matrix

or

b). Find a complex root of the equation $Z^3 - 2z + 2 = 0$ using the Newton's method.

B.SC DEGREE EXAMINATION,
Sixth Semester
Part III-Branch II- Statistics
AOS – Paper I – OPERATIONS RESEARCH-I

Time : Three Hours **Model question paper** Maximum : 75 Marks

SECTION – A (10 x 1 = 10 MARKS)
ANSWER ALL QUESTIONS

1. The suitable model for "output measured in units and cost measured in rupees".
   (a) Symbolic model (b) Analogue model

(c) Iconic model (d) Inventory model.

2. With the help of operations research techniques, Mahalanobis formulated
   (a) First five year plan (b) Second five year plan
   (c) Third five year plan (d) Fourth five year plan.
3. Number of basic feasible solution to a LPP is
   (a) definite (b) infinite
   (c) solution (d) all the above.
4. The variable used in the following constraint $10x1 – 3x2 + 6x3 \geq 100$, to get equality is known as
   (a) Slack variable (b) Surplus variable
   (c) Negative artificial variable (d) Non – negative artificial variable.
5. Minimum of z is equal to
   (a) max (-z) (b) –max (z)
   (c) –min (-z) (d) – max (-z)
6. The process of repeating the same sequence of simplex iterations endlessly without improving the solution is called
   (a) Degeneracy (b) Cycling
   (c) Balancing (d) Unbounded

7. MODI method is used to find the optimum solution for
   (a) Assignment problem
   (b) Sequencing problem
   (c) Transportation problem
   (d) LP problem
8. A(3 x 4) transportation problem will have a. non – degenerate solution if the number of basic variable
   (a) 7 (b) 8
   (c) 6 (d) 12
9. Assignment problem is a special case of
   (a) Inventory problem
   (b) LPP
   (c) Transportation problem
   (d) Sequencing problem
10. Hungarian method is used to solve
   (a) Transportation problem (b) Assignment Problem
   (c) Traveling salesman (d) LPP

SECTION B – (5X5 = 25 marks)
ANSWER ALL QUESTIONS
All questions carry equal marks

11. (a) explain briefly the situations where O.R. techniques are used.
   Or
   (b) Write down any three limitations of O.R
12. (a) What are slack and surplus variables?
   Or

(b) What do you mean by basic feasible solution in LPP?

13. (a) Briefly explain the concept of degeneracy in LPP.

Or

(b) Explain how a minimization problem can be converted into problem with an example.

14. (a) Describe a transportation problem.

Or

(b) For the following transportation problem obtain initial basic feasible solution by North – West corner value :

		To			Supply		
From	I	6	8	4	14		
	II	4	9	8	12		
	III	1	2	6	5		
Demand					6	10	15

15. (a) What do you understand by an assignment problem?

Or

(b) Explain Traveling salesman problem?

SECTION C- (5 x 8 = 40 marks)

Answer the ALL Questions

All questions carry equal marks

16. (a) Discuss the scope of O.R.

Or

(b) Describe three models used in operations research

17. (a) Solve the following LPP graphically

Max $z = 80x_1 + 120x_2$

Subject to

$$x_1 + x_2 \leq 9$$
$$x_1 \geq 2$$
$$x_2 \geq 3$$
$$20x_1 + 50x_2 \leq 360$$
$$x_1, x_2 \geq 0.$$

Or

(b) Solve:

Max $z = 3x_1 + 2x_2$

subject to

$$x_1 + x_2 \leq 4$$
$$x_1 - x_2 \leq 2$$
$$\text{and} \quad x_1, x_2 \geq 0.$$

18. (a) Minimize $z = 2y_1 + 3y_2$

subject to

$$y_1 + y_2 \geq 5$$
$$y_1 + 2y_2 \geq 6$$

$y_1, y_2 \geq 0.$

Or

(b) Explain the procedure of the Big-*M* method.

19. (a) Solve the following transportation problem by 'VAM' to obtain the optimum solution.

		To					
		1	**2**	**3**	**4**	**5**	**Supply**
	1	10	15	20	20	40	50
From	2	20	40	15	30	30	100
	3	30	35	40	55	25	150
Demand		25	115	60	30	70	300

Or

(b) Solve:

		To				
		G	**H**	**I**	**J**	**Supply**
	A	13	25	12	21	18
From	B	18	23	14	9	27
	C	23	15	12	16	21
Demand		14	12	23	17	66

20. (a) Solve the following assignment problem:

	A	B	C	D
W	41	72	39	52
X	22	29	42	58
Y	27	39	60	51
Z	45	50	48	52

B.SC DEGREE EXAMINATION,
Sixth Semester
Part III-Branch II- Statistics
AOS – Paper I – OPERATIONS RESEARCH-II

Time : Three Hours **Model question paper** Maximum : 75 Marks

SECTION – A (10 x 1 = 10 MARKS)
ANSWER ALL QUESTIONS

1. The activity which takes no time or resources in itself is called
   a) Dangling b) Cycling
   c) Network d) Dummy activity
2. Critical path is the path which has

a) Minimum time b) Maximum time
c) Normal time d) Duration of an activity.

3. Group replacement policy is considered when
   a) replacement of an item is expensive
   b) replacement of items that fail completely
   c) replacement of items that fail completely and expensive to be replaced
   d) a part of the item failed.
4. The present worth factor of one rupee spent in n years time is
   a) $(1 + r)^n$ b) $(n + 1)^r$
   c) $(1 + r)^{-n}$ d) $(n + 1)^{-r}$
5. The total time taken to complete all jobs is called
   a) idle time b) ideal time
   c) minimum time d) total elapsed time

6. Jobs m machine sequencing problem can be solved when

   a) Min $a_{i1} \geq$ Max a_{1j} for all j = 2,3,……m-1

   b) Min $a_{i1} \leq$ Max a_{1j} for all j = 2,3,……m-1

   c) Min $a_{i1} \neq$ Max a_{1j} for all j = 2,3,……m-1

   d) None of the above true conditions are satisfied

7. Gain of one player is equal to the loss of the other player. The game is called as

   a) value of the game b) circular game

   c) two person zero-sum game d) square game

8. If a saddle point exists, then

   a) V = maximin = maximax value

   b) V = maximin = minimax value

   c) V $\geq$ maximin $\geq$ maximax value

   d) V $\leq$ maximin < minimax value

9. The method used to evaluate the decisions under risk is

a) EMV criterion b) Hurwiez criterion

c) Maximin criterion d) Minimax criterion

10. Graphical representation of various alternatives and sequence of events in a multi-stage decision problem is called

a) Decision points b) nodes

c) activities d) decision tree

SECTION-B (5 x 6 = 30 marks)
Answer ALL questions.

11. a) Explain labeling technique to find out critical path.

Or

b) Draw the network diagram and find out the critical path by using labeling technique for the following table.

Activity Code	A	B	C	D	E	F	G	H	I	J
Immediate Prodessor	-	A	A	A	D	C	B	G	(E,F,H)	(F,H)
Duration	10	2	3	5	6	15	5	2	7	18

12. a) Explain n jobs two machines sequencing problem.

Or

b) Explain with an example 'n' jobs 'm' machine sequencing problem.

13. a) The cost of a machine is Rs.6,100 and its scrap value is Rs.100. The maintenance costs found from experience are as follows.

When should the machine be replaced?

Year	:	1	2	3	4	5	6	7	8
Maintenance Cost	:	100	250	400	600	900	1200	1600	2000

Or

b) Assume that present value of one rupee to be spent in a year's time is Re.0.9 and capital cost, c is Rs.3,000 and the running costs are given, in the table below. Find the optimum replacement period.

Year	:	1	2	3	4	5	6	7
Running cost Rs.	:	500	600	800	1000	1300	1600	2000

14. a) Explain saddle point method to solve a game problem with an example.

Or

b) Explain dominance property and graphical method to solve a game problem.

15. a) Explain (i) Minimax or Maximin Criteria (ii) Laplace Criteria & (iii) Harwcz Criteria

Or

b) Explain Monte carlo method.

SECTION-C (5 x 12 = 60 marks)

16. a) A project schedule has the following characteristics:
(i) construct the network (ii) compute TE and TL for each event, and
(iii) find the critical path.

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

Or

b) Given the following data and diagram, find out the critical path and the probability that the project will be completed before 39 days..

Task	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Least time	4	5	8	2	4	6	8	5	3	5	6
Greatest time	8	10	12	7	10	15	16	9	7	11	13
Most likely time	5	7	11	3	7	9	12	6	5	8	9

17. a) A ready-made garments manufacturer has to process 12 items through three stages of production, viz., Drawing, Cutting and Sewing. The times taken for each of these items at the different stages are given below in appropriate units.

Item	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Drawing time	15	17	13	14	16	17	22	25	27	28	30	21
Cutting time	10	14	12	16	14	18	10	12	15	16	19	20
Sewing time	25	28	23	27	21	24	29	30	31	26	32	29

Find the optimum sequence of these jobs to be done and find out the total elapsed time and idle times.

Or

b) Determine the optimum sequence, idle times and total elapsed time for the following problem.

Machine

Job

A

B

C

	M1	M2	M3	M4
	20	10	9	20
	17	7	15	17
	21	8	10	21
D	25	5	9	25

18. a) A machine costs Rs.6000 when new. The running cost and salvage value (sale price) at the end of the year is given below. If the interest rate is 10% per year and running costs are assumed to have occurred at 1 2 mid year, find when the machine should be replaced.

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Running costs Rs.	1200	1400	1600	1800	2000	2400	3000
Salvage value Rs.	4000	2666	2000	1500	1000	600	600

Or

b) Let p(t) be the probability that a machine in a group of 30 machines would break down in period 't'. The cost of repairing a broken machine is Rs.200. Preventive maintenance is performed, by servicing all the 30 machines at the end of T-units of time. Preventive maintenance cost is Rs.15 per machine. Find optimal T which will minimize the expected total cost per period of servicing given that:

t	1	2	3	4	5	6	7	8	9	10	11	12
P(t)	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.12.

19. a) Use the concept of dominance to solve the following game:

	I	II	III	IV	Player B
I	3	2	4	0	
II	3	4	2	4	
III	4	2	4	0	
IV	0	4	0	8	Player A

Or

b) Solve the following mx2 game graphically.

Player B

5	4	
-7	9	
-4	-3	Player A
2	1	

20. a) A businessman has three alternatives open to him each of which can be followed by any of the four possible events. The conditional pay offs (in Rs.) for each action-event combination are given below:

	Pay offs conditional on events			
Alternative	**A**	**B**	**C**	**D**
X	8	0	-10	6
Y	-4	12	18	-2
Z	14	6	0	8

Find out which alternative the businessman should choose, if he adopts the

a) Laplace criterion and b) Minimax regret criterion

Or

b) Write a brief note on simulation & its uses and limitations.

B.Sc. DEGREE EXAMINATION, APRIL 2007

Sixth Semester

Part III—Branch II—Statistics

AOS paper-III: Elements of Econometrics

Time: Three hours **Model question paper** Maximum: 75 marks

SECTION A—(10 x 1 = 10 marks)

Answer ALL questions.

Choose the best answer:

1. Econometrics is used in policy formation by
a) governments
b) business organization
c) institutions
d) all the above
2. The tools of econometrics are
a) Mathematics b) statistics
c) (a) & (b) d) none
3. The planning single sector model for Indian Five Year Plan was developed by
a) Dr. C.R. Rao
b) Dr. V.K.R.V. Rao

c) Dr. P.C. Mahalanobis
d) Dr. Amiritya sen
4. A two variable model includes
a) Two explanatory variables
b) Two dependent variable
c) One explanatory and one dependent variable
d) One dependent variable, one explanatory variable and an error variable.
5. The error term in the linear regression model may have
a) Positive values b) negative values
c) Both (a) & (b) d) none
6. BLUE is
a) Best Linear Upper Estimate
b) Best Linear Unbiased Estimate
c) Big Linear Upper Estimate
d) Big least square Unbiased Estimate
7. Auto correlation is also called
a) Simple correlation b) multiple correlation
c) Partial correlation d) serial correlation
8. The linear dependence among independent variable is known as
a) multi collinearity
b) Multiple correlations
c) Multiple regression
d) Rank correlation
9. The first Five Year Plan, a single sector model was constructed based on the variables
a) National income b) investments
c) Both (a) & (b) d) services
10. Prof. P.C. Mahalanobis four sector model is mathematical and is based on the techniques.
a) Statistics b) operations research
c) Modem algebra d) astronomy

SECTION B—(5 x 5 = 25 marks)

Answer ALL questions.

All questions carryEQUAL marks

11. a) Define econometrics and write down any two limitations of Econometrics.

Or

b) Write down the objectives of Econometrics.

12. a) Distinguish between linear and non-linear models with example.

Or

b) Explain the principle of least squares.

13. a) What are dummy variables? Write down their use in Econometric analysis.

Or

b) What do you mean by multi collinearity?

14.a) Describe the method of linear prediction with reference to a general linear model.

Or

b) Write down the statistical assumptions in linear regression model.

15. a) Write down the aim of Five Year Plans in India.

Or

b) What are specification errors

SECTION C—(5 x 5 = 25 marks)

Answer ALL questions.

All questions carry equals

16. a) Write an essay on the scope of Econometrics.

Or

b) Describe any two divisions of Econometrics with example.

17. a) Explain in detail the general linear model in Econometrics.

Or

b) In a linear regression model obtain the least square estimates of the parameters.

18. a) Define auto-correlation and explain the causes of auto-correlation.

Or

b) What are specification errors? Derive the formula for specification error.

19. a) Show that the least square estimates of the parameters of the two variable models are BLUE.

Or

b) Explain the estimation of K variable model under linear restrictions.

20. a) Explain in detail the Mahalanobis model for Five Year Plans.

Or

b) Test for the presence of auto correlation for the follwing data relating to the model

$y = \alpha + \beta x + u$

x: 35 35 38 40 40 42 44 46 50 50

y: 49 40 41 46 52 59 53 61 55 64