SACRED HEART COLLEGE (AUTONOMOUS), THEVARA KOCHI, KERALA, 682013



CURRICULUMAND SYLLABI

FOR

STATISTICS

(FOR UNDERGRADUATE PROGRAMMES)

INTRODUCED FROM 2023 ADMISSIONS ONWARDS

BOARD OF STUDIES IN STATISTICS

Sacred Heart College, Thevara, Kochi, Kerala

Board of Studies in Statistics 2022-2025

Sl.No	Name & Address	Designation/Category
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5	Ms. Sukanya S Consultant in office of the CAG, New Delhi <u>rs223050@gmail.com</u> 9633481701	Post graduate meritorious alumnus nominated by the Principal
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1. Introduction

Statistics is the language of uncertainties riddled with modern information age. It facilitates decision making process by quantifying the elements of chance or uncertainties. Statistics plays a vital role in every field of human activity. Statistics holds a central position in almost every field, including Industry, Mathematics, Physics, Chemistry, Commerce, economics, Botany, Business, Psychology, and Astronomy etc. In today's data driven world, the applications of Statistics in everyday life is an ever present reality that touches all aspects of society.

For almost all undergraduate programmes, especially, for programmes in science and social sciences, there is at least one course in Statistics. The syllabus prepared by the Board of Studies in Statistics of Sacred Heart College (Autonomous), Thevara, consists of syllabi for complementary courses for BSc Mathematics, BSc Psychology and core courses for BCA and BSc Computer Applications. The complementary courses consist of four courses for BSc Mathematics, four courses for BSc Psychology each containing four modules. Core courses offered to BSc Computer Applications comprise of seven courses containing four modules each. The core course for BCA consists of four modules. The mini project included in the syllabus for BSc Mathematics and BSc Computer Applications programmes in their fourth semester (internals only) gives an exposure to students in areas of data collection and analysis using Statistical software like R Software, Excel etc..

2. REGULATIONS FOR CHOICE BASED CREDIT AND SEMESTER SYSTEM (CBCSS) FOR UNDER GRADUATE PROGRAMMES -2023

Preamble

Sacred Heart College, Thevara became an autonomous college under Mahatma University Kottayam in 2014. Since then, academic programmes of the college are being conducted as per the curriculum and syllabus approved by the various Boards of studies and the academic council of the college. The college revised the syllabi of the under graduate(UG) programmes in 2015-16 and 2019-20. The curriculum and syllabus under the choice based credit and semester system (CBCSS) for the under graduate programmes effective from 2019-20 admissions offer Outcome Based Education (OBE). The new 'REGULATIONS FOR CHOICE BASED CREDIT AND SEMESTER SYSTEM (CBCSS) FOR UNDER GRADUATE PROGRAMMES -2023' is a continuation of the effort of the college for providing best education to the UG students of the college.

2.1 Title

These regulations shall be called "SACRED HEART COLLEGE THEVARAREGULATIONS FOR CHOICE BASED CREDIT AND SEMESTER SYSTEM (CBCSS) FOR UNDER GRADUATE PROGRAMMES -2023

2.2 Scope

Applicable to allunder graduate (UG) programmesof the college with effect from 2023 admissions onwards, except otherwise approved by the Academic Council of the College

2.3. Definitions

- i. 'Programme' means the entire course of study and examinations.
- ii. 'Duration of Programme' means the period of time required for the conduct of the programme. The duration of under graduate programmes shall be 6 semesters, post-graduate programme shall be of 4 semesters and M Phil programmes shall be 2 semesters.
- iii. 'Semester' means a term consisting of a minimum of 90 working days, inclusive of examination, distributed over a minimum of 18 weeks of 5 working days, each with 5 contact hours of one hour duration
- iv. 'Course' means a segment of subject matter to be covered in a semester. Each Course is to be designed variously under lectures / tutorials / laboratory or fieldwork / study tour /seminar / project / practical training / assignments/evaluation etc., to meet effective teaching and learning needs.

- v. 'Common Course I' means a course that comes under the category of courses for English and 'Common Course II' means additional language, a selection of both is compulsory for all students undergoing undergraduate programmes(Model I)
- vi. 'Core course' means a course in the subject of specialization within a degree programme.
- vii. 'Complementary Course' means a course which would enrich the study of core courses.
- viii. **'Open course'** means a course outside the field of his/her specialization, which can be opted by a student.
- ix. 'Additional core course' means a compulsory course for all under graduate students (as per the UGC directive) to enrich their general awareness.
- x. The U.G. programmes shall include (a) Common courses (b) Core courses (c) Complementary Courses (d) Open Course (e) Study tour and (f) Internship for selected programmes.
- xi. 'Additional Course' is a course registered by a student over and above the minimum required courses.
- xii. **'Credit'** (**Cr**) of a course is the numerical value assigned to a course according to the relative importance of the content of the syllabus of the programme.
- xiii. 'Extra credits' are additional credits awarded to a student over and above the minimum credits required for a programme for achievements in co-curricular activities carried out outside the regular class hours OR curricular activities/courses completed for value addition, as directed by the College/ department. It is the numerical value assigned to Club activities, Social service, Internship, add on courses etc. which is not added with the total academic credits of the students. Additional credit components
 - (a) Talent & career club activity (optional)
 - (b) Social service (mandatory)
 - (c) Internship for Commerce, Communication and Computer applications (mandatory).
 - (d) Internship (desirable for other programmes).
 - (e) Add on courses (optional)
- xiv. 'Programme Credit' means the total credits of the UG Programme.
- xv. **'Programme Elective course'** Programme Elective course means a course, which can be chosen from a list of electives and a minimum number of courses is required to complete the programme.
- xvi. 'Programme Project' Programme Project means a regular project work with stated credits on which the student undergoes a project under the supervision of a teacher in the parent department / any appropriate Institute in order to submit a dissertation on the project work as specified.
- xvii. 'Internship' is on-the-job training for professional careers.

- xviii. **'Plagiarism**' Plagiarism is the unreferenced use of other authors' material in dissertations and is a serious academic offence.
- xix. '**Tutorial**' Tutorial means a class to provide an opportunity to interact with students at their individual level to identify the strength and weakness of individual students.
- xx. 'Seminar' seminar means a lecture by a student expected to train the student in self-study, collection of relevant matter from the books and Internet resources, editing, document writing, typing and presentation.
- xxi. '**Evaluation**' means every course shall be evaluated by 25% continuous (internal) assessment and 75% end course/end semester (external) assessment.
- xxii. '**Repeat course**' is a course that is repeated by a student for having failed in that course in an earlier registration.
- xxiii. 'Audit Course' is a course for which no credits are awarded.
- xxiv. **'Department'** means any teaching Department offering a course of study approved by the college / Institute as per the Act or Statute of the University.
- xxv. 'Parent Department' means the Department which offers a particular UG/PGprogramme.
- xxvi. 'Department Council' means the body of all teachers of a Department in a College.
- xxvii. **'Faculty Advisor'** is a teacher nominated by a Department Council to coordinate the continuous evaluation and other academic activities undertaken in the Department.
- xxviii. **'College Co-ordinator** means a teacher from the college nominated by the College Council to look into the matters relating to CBCSS
- xxix. **'Letter Grade'** or simply '**Grade**' in a course is a letter symbol (O, A, B, C, D, etc.) which indicates the broad level of performance of a student in a course.
- xxx. Each letter grade is assigned a 'Grade point' (GP) which is an integer indicating the numerical equivalent of the broad level of performance of a student in a course.
- xxxi. **'Credit point'** (CP) of a course is the value obtained by multiplying the grade point (GP) by the Credit (Cr) of the course CP=GP x Cr.
- xxxii. 'Semester Grade point average' (SGPA) is the value obtained by dividing the sum of credit points (CP) obtained by a student in the various courses taken in a semester by the total number of credits taken by him/her in that semester. The grade points shall be rounded off to two decimal places. SGPA determines the overall performance of a student at the end of a semester.
- xxxiii. **Cumulative Grade point average'** (CGPA) is the value obtained by dividing the sum of credit points in all the courses taken by the student for the entire programme by the total number of credits and shall be rounded off to two decimal places.
- xxxiv. 'Grace Marks' means marks awarded to course/s, as per the orders issued by the college from

time to time, in recognition of meritorious achievements in NCC/NSS/Sports/Arts and cultural activities.

2.4 ATTENDANCE

Being a regular college, physical presence in the regular activities, especially, classes and exams, is mandatory for the students. However, if a student secures 75% of attendance s/he is eligible to appear for the exams, provided there are no other impediments like disciplinary proceedings, malpractice record etc.

- i. A maximum of 5 marks (5%) for a course is given for attendance
- ii. **Absence:**A student found absent for one hour in the forenoon or afternoon session is deprived of the attendance for the entire session as far as eligibility for final exam is concerned.
- iii. The hour related calculation in a course is meant for awarding marks for the course concerned.
- iv. Late entry: A student is supposed to be in time in the class. Late arrival related treatment is left to the discretion of the individual teacher. However, as a norm, a late arriving student may be permitted to the class, if it is not inconvenient or distraction to the class as such; though attendance MAY NOT BE GIVEN. Late arrival beyond 5 minutes is treated as ABSENCE; though the teacher may consider permitting the student to sit in the class.
- v. **Leave** : A student has to formally report his/her absence with reasons either in advance, or immediately after the absence for obtaining an approved leave. This applies to all sorts of leave medical, on duty or other.
- vi. The student is supposed to report in prescribedformat on the very next day of the absence; however, upto a week's time is permitted. Afterwards, the leave applications will not be considered.
- vii. The student has to retain a copy/section of the approved leave form and produce the same as proof, in case there is any confusion regarding the leave sanctioning. In the absence of such proof, the claims will not be entertained.
- viii. Duty Leave: A student representing the college in sports, arts, social service or academic matters, has to get sanction from the class teacher concerned and submit the leave application form duly endorsed by teacher concerned & the class teacher, and submit it to the faculty Dean (or Vice Principal). The same will be forwarded by the Dean/Vice Principal for attendance entry. SPORTS: The approval of the Department of Physical Educationand the class teacher is required. The time limit for submission mentioned above is applicable in the case of duty leave as well.
- ix. **CONDONATION**: a student may have the privilege of condonation of attendance shortage (upto a maximum of 10 days) on the basis of genuineness of the grounds of absence (medical reasons or college duty), duly recommended by the department. This is not a matter of right. It is a matter of privilege based on Principal's discretion and the good conduct of the student on the campus. A student of UG programme may have a maximum of two such opportunities.
- x. **RE-ADMISSION** a student whose attendance is inadequate will have to discontinue the studies. Such students, whose conduct is good, may be re-admitted with the approval of Governing Body, on the basis of recommendation from the department, and assurance from the student and the guardian regarding good conduct and compliance in academic and discipline matters. For this the prescribed re-admission fee has to be paid.

As a condition for re-admission, the student should have cleared all academic arrears, or should have appeared for the exams in which he/she is having an arrear (if the results are not out), and should have fulfilled all academic assignments prescribed by the department for compensating for his lack of attendance.

xi. UNAUTHORISED ABSENCE & REMOVAL FROM ROLLS: A student absent from the classes continuously for 10 consequent days without intimation or permission, shall be removed from the rolls, and the matter intimated to the student concerned. On the basis of recommendation of the department concerned, re-admission process may be permitted by the Principal.

2.5 PROGRAMME REGISTRATION

- i. A student shall be permitted to register for the programme at the time of admission.
- ii. A UG student who registered for the programme shall complete the same within a period of 12

continuous semesters from the date of commencement of the programme.

2.6 PROMOTION: A student who registers for the end semester examination shall be promoted to the next semester. However, in extreme circumstances, a student having sufficient attendance who could not register for the end semester examination may be allowed to register notionally by the Principal with the recommendation of the Head of the department concerned and , by paying the prescribed fee.

2.7 UNDER GRADUATE PROGRAMME STRUCTURE

Model I BA/B.Sc.

,		
a	Programme Duration	6 Semesters
b	Total Credits required for successful completion of the	120
	Programme	
с	Credits required from Common Course I	22
d	Credits required from Common Course II	16
e	Credits required from Core course and Complementary	79
	courses including Project	
f	Open Course	3
g	Minimum attendance required	75%

Model I/II B.Com

a	Programme Duration	6 Semesters
b	Total Credits required for successful completion of the	120
	Programme	
с	Credits required from Common Course I	14
d	Credits required from Common Course II	8
e	Credits required from Core and Complementary/	95
	Vocational courses including Project	
f	Open Course	3
g	Minimum attendance required	75%

Model II BA/B.Sc.

a	Programme Duration	6 Semesters
b	Total Credits required for successful completion of the	120
	Programme	
с	Credits required from Common Course I	16
d	Credits required from Common Course II	8
e	Credits required from Core + Complementary + Vocational	93
	Courses including Project	
f	Open Course	3
g	Minimum attendance required	75%

Model III BA/B.Sc./B.Com

a	Programme Duration	6 Semesters
b	Total Credits required for successful completion of the	120
	Programme	
с	Credits required from Common Course I	8
d	Credits required from Core + Complementary + Vocational	109
	Courses including Project	
e	Open Course	3
f	Minimum attendance required	75%

2.8 EXAMINATIONS

All the End Semester Examinations of the college will be conducted by the Controller of Examination. The Principal will be the Chief Controller of Examinations. An Examination committee consists of the Chief Controller of Examinations, Controller of Examinations, Additional Chief Superintendent, Deans, IQAC Coordinator and other faculty members nominated by the Principal will act as an advisory body of the matters relating to the conduct of examinations.

2.9. EVALUATION AND GRADING

The evaluation scheme for each course shall contain two parts;

- a. Continuous Internal Evaluation (CIA) and
- b. End Semester Examination (ESE).

The internal to external assessment ratio shall be 1:3, for both courses with or without practical except for (i) BA Animation and Graphics (ii) BA Animation and Visual effects and (iii) BBA. For courses without practical, there shall be a maximum of 75 marks for external evaluation and maximum of 25 marks for internal evaluation. For courses with practical, generally external evaluation shall be for a maximum of 60 marks and internal evaluation for 20 marks. Both internal and external evaluation shall be carried out in the mark system and the marks are to be rounded to the nearest integer.

The internal to external assessment ratio for BA Animation and Graphics, BA Animation and Visual effects and BBA shall be decided by the respective Board of studies subject to a minimum of 60 marks for external examinations.

2.9.1. Continuous Internal Assessment (CIA)/ Continuous Assessment: The internal evaluation shall be based on predetermined transparent system involving periodic written tests, assignments, seminars/viva/field survey and attendance in respect of theory courses and based on written tests, lab skill/records/viva and attendance in respect of practical courses. The marks assigned to various components for internal evaluation as follows.

	Components	Marks
i.	Assignments	5
ii	Seminar/Quiz/Field survey	5
	/Viva etc.	
iii	Attendance	5
iv	Two Test papers(2x5)	10
	Total	25

Components of Internal Evaluation (for theory without practical)

i. Assignments: Every student shall submit one assignment as an internal component for every course.

Components	Marks
Punctuality	1
Content	2
Conclusion	1
Reference/Review	1
Total	5

ii. **Seminar**: The seminar lecture is expected to train the student in self-study, collection of relevant matter from the books and Internet resources, editing, document writing, typing and presentation.

Components	Marks
Content	2
Presentation	2
Reference/Review	1
Total	5

iii. Evaluation of Attendance

The attendance of students for each course shall be another component of internal assessment.

% of attendance	Mark
Above 90%	5
Between 85 and below 90	4
Between 80 and below 85	3

Between 76 and below 80	2
Between 75 and below 76	1

Components of Internal Evaluation (for theory with practical)

Components of Theory – Internal Evaluation	Marks
Attendance	5
Seminar/ Assignment (Written assignments, preparation of models, charts, posters etc., field survey, field work)	5
Test paper(s)	10
Total	20

Components of Practical- Continuous internal assessment

Components	Marks
Attendance and Lab involvement	2
Record	2
Viva/Model Exam	1
Total	5

iv. Class Tests: Every student shall undergo **two class tests** as an internal component for every course.

2.9.2 End Semester Examination (ESE): The End Semester Examination in theory courses shall be conducted by the college with question papers set by external experts/ question bank. The evaluation of the answer scripts shall be done by the examiners based on a well-defined scheme of evaluation given by the question paper setters/Prepared as per the direction of the Chairman, Board of Examiners. The evaluation of the End Semester Examinations shall be done immediately after the examination preferably through the centralised valuation.

2.9.3 Project

Project work is a part of the syllabus of most of the programmes offered by the college. The guidelines for doing projects are as follows:

- i. Project work shall be completed by working outside the regular teaching hours.
- ii. Project work shall be carried out under the supervision of a teacher in the concerned department or an external supervisor.
- iii. A candidate may, however, in certain cases be permitted to work on the project in an industrial / Research Organization/ Institute on the recommendation of the Supervisor.
- iv. There should be an internal assessment and external assessment for the project work in the

ratio 1:3

- v. The external evaluation of the project work consists of valuation of the dissertation (project report) followed by presentation of the work and viva voce.
- vi. The mark and credit with grade awarded for the program project should be entered in the grade card issued by the college.

-	ů.
Components	Marks
Topic/Area selected	2
Experimentation/Data collection	5
Punctuality-Regularity	3
Compilation	5
Content	5
Presentation	5
Total	25

Components of Internal Evaluation for Projects

2.9.4 Comprehensive Viva-voce

Comprehensive Viva-voce shall be conducted at the end of the programme, which covers questions from all courses in the programme as per the syllabus.

2.10. Grade and Grade Points

For all courses (theory & practical), Letter grades and grade point are given on a 10-point scale based on the total percentage of marks, (CIA+ESE) as given below:-

Percentage of Marks	Grade	Grade Point
		(GP)
95 and above	S Outstanding	10
85 to below 95	A ⁺ Excellent	9
75 to below 85	A Very Good	8
65 to below 75	B^+ Good	7
55 to below 65	B Above Average	6
45 to below 55	C Average	5
35 to below 45	D Pass	4
Below 35	F Fail	0
	Ab Absent	0

SGPA/CGPA	Grade
Equal to 9.5 and above	S Outstanding
Equal to 8.5 and below 9.5	A+ Excellent
Equal to 7.5 and below 8.5	A Very Good
Equal to 6.5 and below 7.5	B+ Good
Equal to 5.5 and below 6.5	B Above Average
Equal to 4.5 and below 5.5	C Average
Equal to 4.0 and below 4.5	D Pass
Below 4.0	F Failure

Grades for the different semesters and overall programme are given based on the corresponding SGPA/CGPA as shown below:

A separate minimum of 30% marks each for internal and external (for both theory and practical) and aggregate minimum of 35% are required for a pass for a course. A candidate who has not secured minimum marks/credits in internal examinations can re-do the same registering along with the end semester examination for the same semester, subsequently. A student who fails to secure a minimum marks/grade for a pass in a course can be permitted to write the examination along with the next batch.

After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below. For the successful completion of semester, a student should pass all courses and score at least the minimum CGPA grade **'D'**. However, a student is permitted to move to the next semester irrespective of her/his SGPA.

Credit Point (CP) of a course is calculated using the formula

 $CP = Cr \times GP$, where Cr = Credit; GP = Grade point

Semester Grade Point Average (SGPA) of a Semester is calculated using the formula

SGPA = TCP/TCr, where

TCP = **Total Credit Point of that semester** = \sum_{1}^{n} CPi;

TCr = Total Credit of that semester = \sum_{1}^{n} Cri

Where n is the number of courses in that semester

Cumulative Grade Point Average (CGPA) of a Programme is calculated using the formula

 $\mathbf{CGPA} = \frac{\sum(\mathrm{SGPA} \times \mathrm{TCr})}{\sum \mathrm{TCr}}$

SGPA/CGPA shall be round off to two decimal places

To ensure transparency of the evaluation process, the internal assessment marks awarded to the students in each course in a semester shall be published on the notice board/website at least one week before the commencement of external examination. There shall not be any chance for improvement for internal mark.

The course teacher and the faculty advisor shall maintain the academic record of each student registered for the course which shall be forwarded to the controller of examinations through the Head of the Department and a copy should be kept in the department for at least two years for verification.

2.11. Registration for the examination

- a. All students admitted in a programme with remittance of prescribed fee are eligible for the forthcoming semester examinations.
- b. Online application for registration to the various End Semester Examinations shall be forwarded to the CE along with prescribed fee for each course in prescribed format.
- c. The eligible candidates who secure the prescribed minimum attendance of the total duration of the course and possess other minimum qualification prescribed in the regulations for each course shall be issued the hall tickets. The hall ticket shall be downloaded by the students from the college website.
- d. The mode of fee remittance shall be through the prescribed bank.

2.12. Supplementary Examinations

Candidates who failed in an examination can write the supplementary examination conducted by the College along with regular examinations.

2.13. Improvement of Examination

A candidate can improve his/her marks once by appearing again for the examination with the subsequent batch with the remittance of prescribed fee. In such cases the better of the two marks shall be taken as the marks awarded to him.

Internal assessment marks shall be carried over to the subsequent semester examination.

There shall not be any provision for improving internal assessment marks.

2.14. Promotion to the Next Higher Semester

A candidate shall be eligible for promotion from one semester to the next higher semester if, a. He / she secures a minimum 75 % attendance and registered for the End Semester Examination

of the programme for which he/she is studying.

b. His / her progress of study and conduct are satisfactory during the semester completed, as per the assessments recorded by the course teachers and the Head of the Department concerned.

2.15 Certificates

- 1. Degree certificates are issued by the Mahatma Gandhi University, Kottayam as per the act and statues of the University on the submission of the consolidated mark / score cards of the students by the College.
- 2. A consolidated mark / scored card shall be issued to the candidates after the publication of the results of the final semester examination taken by the candidate.

3. A Course Completion Certificate with classification shall be issued to students till the provisional certificate is issued by the university.

2.16. Award of Degree

The successful completion of all the courses with 'D' grade shall be the minimum requirement for the award of the degree.

2.17.Monitoring

There shall be a Monitoring Committee constituted by the principal consisting of faculty advisors, HoD, a member from teaching learning evaluation committee (TLE) and the Deans to monitor the internal evaluations conducted by college. The Course teacher, Class teacher and the Deans should keep all the records of the internal evaluation, for at least a period of two years, for verification. Every Programme conducted under Choice Based Credit System shall be monitored by the College Council under the guidance of IQAC Coordinator, Controller of Exams, academic deans and HoDs.

2.18. Grievance Redressal Mechanism

In order to address the grievance of students regarding Continuous internal assessment (CIA) a three-level Grievance Redressal mechanism is envisaged. A student can approach the upper level only if grievance is not addressed at the lower level.

Level 1: At the level of the concerned course teacher

Level 2: At the level of a department committee consisting of the Head of the Department, a coordinator of internal assessment for each programme nominated by the HoD and the course teacher concerned.

Level 3: A committee with the Principal as Chairman, Dean of the Facultyconcerned, HOD of the department concerned and one member of the Academic council nominated by the principal every year as members.

2.19. PATTERN OF QUESTIONS (For BSc Mathematics (complementary) and BSc Computer Applications (core) courses)

PART	NO.OF	MARKS PER	✤ MAXIMUM
	QUESTIONS	QUESTION	MARKS FROM EACH PART
А	12	2	20
В	8	5	25
С	4	10	30

For BSc Mathematics (complementary) and BSc Computer Applications (core) course Students can answer any number of questions from each part but maximum mark for each part will be limited as per this column.

PATTERN OF QUESTIONS (For BCA (core course))

PART	NO.OF	MARKS PER	MARKS
	QUESTIONS	QUESTION	FROM EACH
			PART
А	10	1	10
В	12	2	16
С	7	5	25
D	4	12	24

PART	NO.OF	MARKS PER	MARKS
	QUESTIONS	QUESTION	FROM EACH
			PART
А	10	1	10
В	10	2	16
С	7	5	25
D	4	12	24

PATTERN OF QUESTIONS (For BSc Psychology (complementary course))

3. Statistics(Complementary Courses) for BSc. Mathematics

Programme Outcome

	Programme Outcome
	Critical Thinking: Take informed actions after identifying the assumptions that
PO 1	frame our thinking and actions, checking out the degree to which these
FUT	assumptions are accurate and valid, and looking at our ideas and decisions
	(intellectual, organizational, and personal) from different perspectives.
	Effective Communication: Speak, read, write and listen clearly in person and
PO 2	through electronic media in English and in one Indian language, and make
	meaning of the word by connecting people, ideas, books, media and technology.
	Effective Citizenship: Demonstrate empathetic social concern and equity
PO 3	centered national development, and the ability to act an informed awareness of
	issues and participate in civic life through volunteering.
	Environment and Sustainability: Understand the issues of environmental
PU 4	contexts and sustainable development.
DO5	Ethics: Recognise different value systems including your own, understand the
FUS	moral dimensions of your decisions, and accept responsibility for them.
	Global Perspective: Understand the economic, social and ecological
PO 6	connections that link the world's nations and people.

BACHELOR OF SCIENCE (MATHEMATICS)

	PROGRAMME SPECIFIC OUTCOMES(PSOs)
PSO1	Prepare graduates who will have a successful professional career in software
	industry, government, academia, research, and other areas where computer
	applications are deployed .
PSO2	Give an overview of the topics in Computer science like networking, web
	development, database queries, cyber security and software engineering.
PSO3	Develop programming skills, networking skills, learn applications, packages,
	programming languages and modern techniques of IT
PSO4	Apply theoretical concepts to design and develop programs and develop
	industry-focused skills to lead a successful career.
PSO5	Acquire good knowledge and understanding in advanced areas of mathematics
	and statistics.

		Hours		М	arks	Total
Semester	Title of the Course	per Week	Credit	Internal	External	
Ι	Fundamentals of Statistics	4	3	25	75	100
II	Theory of Probability and Random variables	4	3	25	75	100
Ш	Theory of Distributions	5	4	25	75	100
IV	Statistical Inference	5	4	25	75	100

Statistics (Complementary Courses) for BSc. Mathematics

SEMESTER I

23U1CPSTA01/23U1CRCSTA01 - FUNDAMENTALS OF STATISTICS

Credits: 3

Total 60 hours

(Common for B.Sc. Mathematics and Computer Applications programmes)

Bridge course(5 hours)

(N.B. No questions shall be asked for the end semester examination from this section)

Meaning and scope of statistics, Population and sample, Census and Sampling, Advantages of sampling compared to census, Collection of data, Primary and Secondary data, Questionnaire, Types of data – quantitative and qualitative data; Classification and Tabulation, Frequency distributions – discrete, continuous and cumulative frequency distributions; Representation of Statistical data – Bar diagrams, Pie diagrams, Histograms, Frequency polygons and frequency curves, ogives; stem and leaf charts

Module I (15hours)

Measures of central tendency – Mean, Median, Mode, Geometric Mean, Harmonic Mean - their properties; quartiles, deciles, percentiles

Module II (15 hours)

Absolute and relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation- their properties; Coefficient of Variation, Box plots, Lorenz Curve.

Module III(10) hours)

Moments – Raw moments, Central moments, Absolute moments- Inter Relations; Skewness, Measures of skewness – Pearson, Bowley and Moment measure; Kurtosis – Moment measure of kurtosis.

Module IV (20 hours)

Scatter diagram, Curve fitting – Method of least squares, fitting of a straight line, second degree curve, exponential curve, power curve. Correlation and its properties, Rank correlation, Regression equations and their identification. Probable error, Coefficient of determination, Linearregression (Three variables case), partial and multiple correlations, their expressions and properties (no derivation).

Practical assignment using Excel (5 marks)

- 1. Basic data manipulation techniques sorting filtering conditional formatting.
- 2. Descriptive statistics using statistical function

References

- 1 S.C. Gupta and V. K.Kapur. Fundamentals of Mathematical Statistics, Sultan Chand and sons New Delhi
- 2 S.P. Gupta. Statistical Methods ,Sultan Chand & Sons Delhi
- 3 B.L. Agarwal. Basic Statistics, New Age International (p) Ltd.
- 4 S.C.Gupta and V.K.Kapoor. Fundamentals of Applied Statistics, Sultan Chand & Sons Delhi
- 5 ParimalMukhopadhya: Mathematical Statistics, New Central Book Agency (p) Ltd, Calcutta

COURSE OUTCOMES

	COURSE OUTCOMES
CO 1	Understand different measures of central tendency, their properties and
	different measures of positional averages.
CO 2	Understand different measures of dispersions – absolute and relative
	measures of dispersion.
CO 3	Understand the concepts of Box plots and Lorenz curve.
CO 4	Understand moments – raw and central moments – inter relations.
CO 5	Understand the concepts of skewness and kurtosis, scatter diagram, curve
	fitting – method of least squares.
CO6	Understand and apply the concepts of fitting of straight line, second degree
	curve, exponential curve, power curve.
CO7	Correlation and its properties, Rank correlation, Regression equations and
	their identification. Probable error, Coefficient of determination.
C08	Linear regression(Three variables case), partial and multiple correlations,
	their expressions and properties (no derivation)

SEMESTER II

23U2CPSTA02 /23CRCSTA02-THEORY OF PROBABILITY AND RANDOM VARIABLES

Credits:3

Total 60 hours

(Common for B.Sc. Mathematics and Computer Applications programmes)

Module I (20 hours)

Random Experiments, Sample Space, Events, Algebra of events, Borel field of events. Approaches to probability- Statistical, Classical and Axiomatic; Addition theorem of probability, Conditional probability, Multiplication theorem, Independence of events, Theorem of total probability, Bayes' theorem.

Module II (15hours)

Random variables, probability distributions and their properties, Distribution functions, Reliability functions, change of variables (univariate case only)

-Module III (10 hours)

Joint distribution of a pair of random variables, marginal and conditional distributions, Independence of random variables

Module IV (15 hours)

Index numbers – Simple and Weighted index numbers – Laspeyre's, Paasche's, Bowley's and Fisher's index numbers; Cost of living index numbers and their constructions.

Time series- Components of a time series data, Determination of trend- Moving average and curve fitting methods; Computation of and seasonal indices – Method of simple averages

- 1. S.P. Gupta: Statistical Methods .Sultan Chand and Sons Delhi.
- 2. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- 3. B.L. Agarwal: Basic Statistics, New Age International (p) Ltd.
- 4. ParimalMukhopadhya: Mathematical Statistics, New Central Book Agency (p) Ltd, Calcutta
- 5. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.
- 6. Murray R Spiegel, John Schiller, R. AluSrinivassan: Theory and problems of PROBABILITY AND STATISTICS, Schaum's Outlines, Tata McGraw-Hill Publishing Company Ltd

COURSE OUTCOME

	COURSE OUTCOMES	
CO 1	Understand different approaches to probability - their properties, Addition	
	& Multiplication theorem, Theorem of total probability.	
CO 2	Understand random variables, probability distributions - their properties,	
	distribution functions, Reliability functions, change of variables .	
CO 3	Understand joint distribution of a pair of random variables, marginal &	
	conditional distributions, and independence of random variables.	
CO 4	Understand different types of index numbers, tests to be satisfied by the	
	index numbers, cost of living index numbers and their constructions.	
CO 5	Understand the concepts of time series data, determination of trend,	
	computation of seasonal indices.	

SEMESTER III

23U3CPSTA03/23U3CRSTA03 - THEORY OF DISTRIBUTIONS

Credits:4

Total 75 hours

(Common for B.Sc. Mathematics and Computer Applications programmes)

Module I (15hours)

Mathematical Expectation- Moments, Moment generating functions(m.g.f.) and its properties, Characteristic function and its properties, Conditional expectation, Cauchy Schwartz inequality, Correlation between two random variables.

Module II (25 hours)

Probability distributions –Discrete type distributions- Uniform, Bernoulli, Geometric, Binomial, Poisson,– their properties, mean, variance, m.g.fs; Lack of memory property(LMP). Fitting of binomial and Poisson distributions

Continuous type distributions- Rectangular, Exponential, Gamma, Beta, their properties, mean, variance, m.g.fs Normal, Standard normaldistributions properties, mean, variance, m.g.fs; Fitting of a normal distribution, and Lognormal distributions.

Module III (15 hours)

Tchebycheff's inequality, Bernoulli's law of large numbers, Weak law of large numbers, Central limit theorem (Lindberg Levy form with proof), Limiting distributions of binomial and Poisson distributions

Module IV(20hours)

Methods of sampling – Simple random sampling, systematic sampling stratified and cluster sampling, Statistic and Parameter, Sampling distributions, standard error, Sampling distribution of mean and Variance, Chi-square, t and F – their properties and interrelations.

Assignment using Excel (5 marks)

- 1. Generate random numbers using normal distribution.
- 2. Fit a binomial distribution for given parameters n and p.
- 3. Fit a Poisson distribution for a given parameter $\boldsymbol{\lambda}$

- 1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
- Hogg, R.V. and Craig A.T. (1970). Introduction to Mathematical Statistics, Amerind Publishing Co, Pvt. Ltd.
- 3. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- 4. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.
- 5. Johnson, N.L, Kotz, S. and Balakrishnan N. (1994). Continuous Univariate Distribution, John Wiley, New York.

	COURSE OUTCOMES
CO1	Understand the concept of Mathematical expectation, M.G.F,
	characteristic function and their properties
CO 2	Understand the concepts of Discrete type probability
	distributions and their properties
CO 3	Fitting of Binomial and Poisson distributions
CO 4	Understand the concepts of continuous type probability
	distributions and their properties
CO 5	Understand -Normal, Standard normal and Lognormal
	distributions
CO 6	Understand lack of memory property, Fitting of Normal
	distributions
CO 7	Understand Tchedycheff'sinequality,Bernoulli's law of large
	numbers, Weak law and Central limit theorem
CO 8	Methods of sampling
CO 9	Understand sampling distributions, standard error

SEMESTER IV

23U4CPSTA04 /23U4CRCST04-STATISTICAL INFERENCE

Credits:4

Total 75 hours

(Common for B.Sc. Mathematics and Computer Applications programmes)

Module I (15 hours)

Concepts of Estimation, Types of Estimation - Point Estimation, Interval Estimation; Properties of Estimation -Unbiasedness, Efficiency, Consistency and Sufficiency

Module II (20 hrs)

Methods of Estimation MLE, Methods of Moments, Method of Minimum Variance, Cramer-Rao Inequality (without proof), Interval Estimation for Mean, Variance and Proportion.

Module III(20 hours)

Testing of hypothesis, Statistical hypothesis, Simple and composite hypothesis, Null and Alternate hypotheses, Type I and Type II errors, Critical Region, Size of the test, P value, Power, Neyman-Pearson approach(without proof), Small sample tests – Z-test, t- test, Paired t –test, Chi-square test for testing variance and F test for testing equality of variances.

Module IV (20 hours)

Large Sample test- Z test for testing population means, equality of population means; Testing population proportion, equality of two population proportions; Chi-Square test - goodness of fit, test of independence; Basic principles of designs of experiments-Randomization, Replication and Local control, Analysis of Variance (one way classification), Non- parametric tests Wilcoxon signed rank test, Mann Whitney U test

Mini Project (10 hrs) [internals only^{*}]

Data Analysis using statistical software – Excel/R/SPSS.

*The mini project carries 10 marks and replaces the internal components, namely assignments and seminar

- 1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
- Richard Johnson (2006): Probability and Statistics for Engineers (Miller and Freund). Prentice Hall.
- 3. S.C Gupta : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- 4. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- 5. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.

	COURSE OUTCOMES
CO 1	Describe and apply the concept of Estimation
	and its properties
CO 2	Describe and apply Interval Estimation
CO 3	Apply the concept and methods in testing of
	hypothesis.
CO 4	Apply Large Sample Tests and non parameteric
	tests

4. Statistics (Core courses) for B.Sc. Computer Applications

PROGRAMME OUTCOMES (POs)	PO DESCRIPTION
PO1	Critical Thinking& Deep Domain Knowledge
PO2	Effective Communication
PO3	Contribute to Nation Building
PO4	Care for the Environment
PO5	Ethical Values
PO6	Global Perspective

PROGRAMME OUTCOMES

PROGRAMME SPECIFIC OUTCOMES

PROGRAMME SPECIFIC OUTCOMES (PSOs)	PSO DESCRIPTION
PSO1	Pursue a successful professional career in the software industry, government, academia, research, or other areas where computer applications are deployed.
PSO2	Demonstrate proficiency in areas of Computer science such as, networking, web development, database queries, cyber security and software engineering.
PSO3	Develop programming skills, networking skills, learn applications, packages, programming languages and modern techniques of IT.
PSO4	Apply theoretical concepts to design and develop programs and develop industry-focused skills for a successful career.
PSO5	Acquire an understanding in advanced areas of mathematics and statistics.

Semester	Title of the Course	Hours per Week	Credit	Marks		Total
				Internal	External	
Ι	Fundamentals of Statistics	4	3	25	75	100
II	Theory of Probability and Random variables	4	3	25	75	100
Ш	Theory of Distributions	5	4	25	75	100
IV	Statistical Inference	5	4	25	75	100
	Sample Survey analysis and Design of Experiments	5	4	25	75	100
V	Statistical Quality Control and Operations Research	5	4	25	75	100
VI	Computer aided data analysis using Excel and R studio	5	4	25	75	100

Statistics (Core Courses) for BSc. Computer Applications

SEMESTER I

23U1CPSTA01 /23U1CRCSTA01 FUNDAMENTALS OF STATISTICS

Credits:3

Total 60 hours

(Common for B.Sc. Mathematics and Computer Applications programmes)

Bridge course(5 hours)

(N.B. No questions shall be asked for the end semester examination from this section)

Meaning and scope of statistics, Population and sample, Census and Sampling, Advantages of sampling compared to census, Collection of data, Primary and Secondary data, Questionnaire, Types of data – quantitative and qualitative data; Classification and Tabulation, Frequency distributions – discrete, continuous and cumulative frequency distributions; Representation of Statistical data – Bar diagrams, Pie diagrams, Histograms, Frequency polygons and frequency curves, ogives; stem and leaf charts

Module I (15hours)

Measures of central tendency – Mean, Median, Mode, Geometric Mean, Harmonic Mean - their properties; quartiles, deciles, percentiles

Module II (15 hours)

Absolute and relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation- their properties; Coefficient of Variation, Box plots, Lorenz Curve.

Module III(10) hours)

Moments – Raw moments, Central moments, Absolute moments- Inter Relations; Skewness, Measures of skewness – Pearson, Bowley and Moment measure; Kurtosis – Moment measure of kurtosis

Module IV (20 hours)

Scatter diagram, Curve fitting – Method of least squares, fitting of a straight line, second degree curve, exponential curve, power curve. Correlation and its properties, Rank correlation, Regression equations and their identification. Probable error, Coefficient of determination, Linearregression (Three variables case), partial and multiple correlations, their expressions and properties (no derivation)

Practical assignment using Excel (5 marks)

- 1. Basic data manipulation techniques sorting filtering conditional formatting.
- 2. Descriptive statistics using statistical function

- 6 S.C. Gupta and V. K.Kapur. Fundamentals of Mathematical Statistics, Sultan Chand and sons New Delhi
- 7 S.P. Gupta. Statistical Methods ,Sultan Chand & Sons Delhi
- 8 B.L. Agarwal. Basic Statistics, New Age International (p) Ltd.
- 9 S.C.Gupta and V.K.Kapoor. Fundamentals of Applied Statistics, Sultan Chand & Sons Delhi
- 5. ParimalMukhopadhya: Mathematical Statistics, New Central Book Agency (p) Ltd, Calcutta

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	COURSE OUTCOMES
CO1	Become familiar with measures of central tendency and quantiles
CO2	Understand the measures of dispersion, box plot and Lorenz curve which are some statistical graphs
CO3	Learn about moments, skewness and kurtosis
C04	Explain the concepts of scatter diagram, correlation and regression

SEMESTER II

23U2CPSTA02 /23CRCSTA02:THEORY OF PROBABILITY AND RANDOM VARIABLES

Credits:3

Total 60 hours

(Common for B.Sc. Mathematics and Computer Applications programmes)

Module I (15 hours)

Random Experiments, Sample Space, Events, Algebra of events, Borel field of events. Approaches to probability- Statistical, Classical and Axiomatic; Addition theorem of probability, Conditional probability, Multiplication theorem, Independence of events, Theorem of total probability, Bayes' theorem.

Module II (20hours)

Random variables, probability distributions and their properties, Distribution functions, Reliability functions, change of variables (univariate case only)

Module III (10 hours)

Joint distribution of a pair of random variables, marginal and conditional distributions, Independence of random variables

Module IV (15hours)

Index numbers – Simple and Weighted index numbers – Laspeyre's, Paasche's, Bowley's and Fisher's index numbers; Cost of living index numbers and their constructions.

Time series- Components of a time series data, Determination of trend- Moving average and curve fitting methods; Computation of and seasonal indices – Method of simple averages

- 1. S.P. Gupta: Statistical Methods .Sultan Chand and Sons Delhi.
- 2. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- 3. B.L. Agarwal: Basic Statistics, New Age International (p) Ltd.
- 4. ParimalMukhopadhya: Mathematical Statistics, New Central Book Agency (p) Ltd, Calcutta
- 5. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.
- 6. Murray R Spiegel, John Schiller, R. AluSrinivassan: Theory and problems of PROBABILITY AND STATISTICS, Schaum's Outlines, Tata McGraw-Hill Publishing Company Ltd

	COURSE OUTCOMES
CO1	Understand different approaches to probability - their
	properties, Addition & Multiplication theorem, Theorem of
	total probability.
CO2	Learn about random variable, pdf and distribution
	function, Reliability functions, change of variables (univariate
	case only).
CO3	Explain the concepts of joint distribution, marginal and
	conditional distribution, independence of random variables
	······
CO4	Describe the concepts of index numbers and introduce time
	series

SEMESTER III

23U3CPSTA03/23U3CRSTA03 -THEORY OF DISTRIBUTIONS

Credits :4

Total 75 hours

(Common for B.Sc. Mathematics and Computer Applications programmes)

Module I (15 hours)

Mathematical Expectation- Moments, Moment generating functions(m.g.f.) and its properties, Characteristic function and its properties, Conditional expectation, Cauchy Schwartz inequality, Correlation between two random variables.

Module II (25 hours)

Probability distributions –Discrete type distributions- Uniform, Bernoulli, Geometric, Binomial, Poisson,– their properties, mean, variance, m.g.fs; Lack of memory property(LMP). Fitting of binomial and Poisson distributions

Continuous type distributions- Rectangular, Exponential, Gamma, Beta, their properties, mean, variance, m.g.fs Normal, Standard normal distributions properties, mean, variance, m.g.fs; Fitting of a normal distribution, and Lognormal distributions.

Module III (15 hours)

Tchebycheff's inequality, Bernoulli's law of large numbers, Weak law of large numbers, Central limit theorem (Lindberg Levy form with proof),Limiting distributions of binomial and Poisson distributions **Module IV(20 hours)**

Methods of sampling – Simple random sampling, systematic sampling stratified and cluster sampling, Statistic and Parameter, Sampling distributions, standard error, Sampling distribution of mean and Variance, Chi-square, t and F – their properties and interrelations

Assignment using excel (5 marks)

- 1. Generate random numbers using normal distribution.
- 2. Fit a binomial distribution for given parameters n and p.
- 3. Fit a Poisson distribution for a given parameter λ

- 1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
- Hogg, R.V. and Craig A.T. (1970). Introduction to Mathematical Statistics, Amerind Publishing Co, Pvt. Ltd.

- 3. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- 4. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.
- 5. Johnson, N.L, Kotz, S. and Balakrishnan N. (1994). Continuous Univariate Distribution, John Wiley, New York.

	COURSE OUTCOMES
CO1	Understand the concept of Mathematical expectation, M.G.F, characteristic function and their properties
CO2	Learn about the concepts of Discrete type probability
	distributions and their properties, continuous type probability
	distributions
CO3	Understand Tchebycheff'sinequality,Bernoulli's law of large
	number's, Weak law and Central limit theorem
CO4	Learn the Methods of sampling, sampling
	distributions, standard error
SEMESTER IV

23U4CPSTA04/23U4CRCST04 - STATISTICAL INFERENCE

Credits :4

Total 75 hours

(Common for B.Sc. Mathematics and Computer Applications programmes)

Module I (15 hours)

Concepts of Estimation, Types of Estimation - Point Estimation, Interval Estimation; Properties of Estimation -Unbiasedness, Efficiency, Consistency and Sufficiency

Module II (20 hrs)

Methods of Estimation MLE, Methods of Moments, Method of Minimum Variance, Cramer-Rao Inequality (without proof), Interval Estimation for Mean, Variance and Proportion.

Module III(20 hours)

Testing of hypothesis, Statistical hypothesis, Simple and composite hypothesis, Null and Alternate hypotheses, Type I and Type II errors, Critical Region, Size of the test, P value, Power, Neyman-Pearson approach(without proof), Small sample tests – Z-test, t- test, Paired t –test, Chi-square test for testing variance and F test for testing equality of variances

Module IV (20 hours)

Large Sample test- Z test for testing population means, equality of population means; Testing population proportion, equality of two population proportions; Chi-Square test - goodness of fit, test of independence; Basic principles of designs of experiments-Randomization, Replication and Local control, Analysis of Variance (one way classification), Non- parametric tests Wilcoxon signed rank test, Mann Whitney U test

Mini Project (10 hrs) [internals only^{*}]

Data Analysis using statistical software - Excel/R/SPSS.

*The mini project carries 10 marks and replaces the internal components, namely assignments and seminar

References

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

- Richard Johnson (2006): Probability and Statistics for Engineers (Miller and Freund). Prentice Hall.
- 3. S.C Gupta : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- 4. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- 5. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.

	COURSE OUTCOMES
CO1	Understand the concept of Estimation and its
	properties
CO2	Implement the methods of estimation and interval
	estimation
CO3	Apply the concept and methods in testing of
	hypothesis.
CO4	Evaluate theLarge Sample Tests and non-parametric
	tests.

SEMESTER IV

23U4CRSTA05 - SAMPLE SURVEY ANALYSIS AND DESIGN OF EXPERIMENTS

Credits -4

Total 75 Hours

(For B.Sc. Computer Applications programme only)

Module I (20 hours)

Types of sampling – Probability and non probability sampling- Judgment, Mixed Sampling, Quota sampling, Sampling and Non sampling errors

Simple random sampling: Simple random sampling with and without replacement, procedures of selecting a sample, unbiased estimates of the population mean and population total-their variances and estimates of the variances, confidence interval for population mean and total, simple random sampling for attributes, estimation of sample size based on desired accuracy for variables and attributes.

Module II (20 hours)

Stratified random sampling: Estimation of the population mean and population total-their variances and estimates of the variances, proportional allocation and Neyman allocation of sample sizes, cost function, optimum allocation and comparison with simple random sampling.

Module III(15 hours)

Fundamental principles of experimentation, need for design of experiments, analysis of one way, two way and three way classified data.

Module IV(20 hours)

Basic Designs- CRD, RBD, LSD and their analysis.

- Daroga Singh, F.S.Chaudhary(1986) :Theoryand Analysis of Sample survey DesignsNew Age International (p) Ltd..
- 2. S.C. Gupta and V.K. Kapoor (2014): Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- 3. Cochran, W.G. (2007). Sampling Techniques, (3rd ed.), John Wiley and Sons.

- 4 D.D.Joshi (1987): Linear Estimation And Design of Experiments, New Age International (P) Ltd.
- Das, M.N. and Giri, N.C. (2008).Design and Analysis of Experiments, New Age International (P) Limited Publishers.

	COURSE OUTCOMES
CO1	Understand the concept of sampling and types of sampling
CO2	Learn about stratified random sampling and different types of allocation
CO3	Apply the concept of experimentation and learn one way and two way ANOVA
CO4	Analyse CRD, RBD and LSD

SEMESTER V

23U5CRSTA06 - STATISTICAL QUALITY CONTROL AND OPERATIONS RESEARCH

Credits-4

Total 75 Hours

(For B.Sc. Computer Applications programme only)

Module I (15 hours)

Aims and Objectives of statistical process control and product control, importance of SQC in industry, Control charts, OC curve for control charts, probability limit, tolerance limit, 3 sigma limit and warning limit.

Module II (20 hours)

Control charts for variables $-\overline{X}$, R chart determining trial control limit and out of control limit and their interpretation.Control Charts for attributes -p, np and c chart(Introduction only)

Module III(20 hours)

O R – Introduction, applications, advantages and disadvantages; Linear Programming Problems (LPP – graphic method review, simplex method, duality

Module IV(20 hours)

Transportation and assignment problems – North West, least cost, Vogel's and UV method Game Theory – Introduction, Two person zero sum game, pure and mixed strategies, saddle point solution.

- 1. S.C. Gupta and V.K. Kapoor(2014): Fundamentals of Applied Statistics, Sultan Chand and Sons.
- Montgomery, D.C. (2010).Statistical Quality Control: A Modern Introduction,(6th ed.), Wiley India Pvt. Ltd.
- 3. M. Mahajan(2016): Statistical Quality Control,: DhanpatRai& Co. (P) Limited
- 4. R.C. Gupta(2001): Statistical Quality Control: 9thedition,Khanna Publishers
- KantiSwarup, Gupta P.K., Man Mohan (2010): Operations Research, Sultan Chand and Sons, New Delhi.
- 6. Gupta R.K. (2010): Operations Research, Krishna Prakashan Media (P) Ltd., Meerut

- 7. Bronson, R.andNaadimuthu, G. (1997). Operation Research, Schaum's Outline Series, McGraw-Hill Education
- 8. Douglass C Montgomery: Introduction to Statistical Quality Control, Wiley India Edition

	COURSE OUTCOMES
CO1	Understand the concept of SQC and its importance
CO2	Learn different control charts in SQC
CO3	Gain knowledge about OR and the concepts of LPP
CO4	Solve problems in LPP- transportation problems and
	game theory

SEMESTER V

23U5CRSTA06 -STATISTICAL QUALITY CONTROL AND OPERATIONS RESEARCH

Credits-4

Total 75 Hours

(For B.Sc. Computer Applications programme only)

Module I (15 hours)

Aims and Objectives of statistical process control and product control, importance of SQC in industry, Control charts, OC curve for control charts, probability limit, tolerance limit, 3 sigma limit and warning limit.

Module II (20 hours)

Control charts for variables – \overline{X} , R chart determining trial control limit and out of control limit and their interpretation.

Control Charts for attributes - p ,np and c chart(Introduction only)

Module III(20 hours)

O R – Introduction, applications, advantages and disadvantages; Linear Programming Problems (LPP – graphic method review, simplex method, duality

Module IV(20 hours)

Transportation and assignment problems – North West, least cost, Vogel's and UV method Game Theory – Introduction, Two person zero sum game, pure and mixed strategies, saddle point solution.

- 1. S.C. Gupta and V.K. Kapoor(2014): Fundamentals of Applied Statistics, Sultan Chand and Sons.
- Montgomery, D.C. (2010).Statistical Quality Control: A Modern Introduction,(6th ed.), Wiley India Pvt. Ltd.
- 3. M. Mahajan(2016): Statistical Quality Control,: DhanpatRai& Co. (P) Limited
- 4. R.C. Gupta(2001): Statistical Quality Control: 9thedition,Khanna Publishers
- KantiSwarup, Gupta P.K., Man Mohan (2010): Operations Research, Sultan Chand and Sons, New Delhi.
- 6. Gupta R.K. (2010): Operations Research, Krishna Prakashan Media (P) Ltd., Meerut

Bronson, R. and Naadimuthu, G. (1997). Operation Research, Schaum's Outline Series, McGraw-Hill Education

7. Douglass C Montgomery: Introduction to Statistical Quality Control, Wiley India Edition

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	COURSE OUTCOMES
CO1	Understand the concept of SQC and its importance
CO2	Learn different control charts in SQC
CO3	Gain knowledge about OR and the concepts of LPP
CO4	Solve problems in LPP- transportation problems and game
	theory

SEMESTER VI

23U6CRSTA07- COMPUTER AIDED DATA ANALYSIS USING EXCEL AND R STUDIO Credits:4 Total 75 Hours

(For B.Sc. Computer Applications programme only)

Bridge Course: Introduction to R with history of development of R. R download and library functions. R console, R symbols, functions and terms. Communicating with R using different ways (using word processor, excel, SPSS etc.). Getting data into R. Input data from keyboard using c (), scan () functions.

Module I(20 hours)

Elementary Statistical analysis using Excel: Statistical tests concerning means (One sample Z test for mean, One sample t test for mean, Two sample Z test for means, Two sample t test for means, Paired t test), The F test for variance

Module II (15 hrs)

Correlation Analysis using Excel- simple and multiple correlation, Simple Regression analysis, Fitting of Trend line

Module III (20hours)

Visualization of data using R software: Scatter plot/ XY Plot/ Histogram / frequency curve /Bar diagram, Pie diagram. Measures of central tendency- Arithmetic mean, Median, Mode, Geometric mean. Dispersion- Variance, correlation coefficient, regression, trend line.

Module IV (20 hours)

Inferential Statisticsusing R software: z test, 1sample test, 2sample test, t- test, Chi-square test.

- Stephen L Nelson and Julia Kelly (2001) The complete Reference Office XP, Tata McGraw-Hill
- 2. Sarma KVS (2001), Statistics Made Simple Do It Yourself on PC, Prentice Hall of India.

- 3. The R book. (2007) Michael J. Crawley.
- 4. Statistics: An introduction using R (2005). Michael J. Crawley.
- 5. Hand book of Statistical analysis using R (2006). Brian S. Everitt and TorstenHothorn.

	COURSE OUTCOMES
CO1	Analysis of test in statistics using excel
CO2	Correlation and Regression Analysis using Excel
CO3	Applying R software for visualisation and measure of central tendency, dispersion and regression
CO4	Analysis of test in statistics using R

Note: The question paper pattern of the examination of this course detailed as below

Question paper contains two parts, Part A and Part B.

In Part A, there are 8 questions each carries 5 marks and maximum marks from this part is 25. In Part B there are 8 questions each carries 10 marks and maximum marks from this part is 50. Part A will be a written examination to assess the theoretical knowledge of the students in statistical software Excel and R studio, Part B will be practical examinations using Statistical software Excel and R studio.

5. Syllabus of Statistics

(Core course for BCA)

Semester	Title of the	Hours per	credits	Marks		Total marks
	course	week				
				internals	externals	
III	Basic Statistics	4	4	25	75	100

SEMESTER III

23U3CRBCA7 - BASIC STATISTICS

(For BCA programme only)

Credits - 4

Total 72 Hours

COURSE DETAILS

Bridge course

Introduction to Statistics, Population and Sample, Various Statistical Organization, Collection of Data, Various methods of data collection, Census and Sampling Methods of Sampling - Simple Random Sampling (with and without replacement) – stratified sampling – systematic sampling (Method only), Types of data – quantitative, qualitative, discrete and continuous frequency and non-frequency, Classification and Tabulation, Diagrammatic representation – Bar diagram, pie diagram; pictogram and cartogram, Graphical representation – histogram; frequency polygon; frequency curve; ogives and stem and leaf chart.

Module I

Measures of Central Tendency - Mean; Median; Mode; Geometric Mean; Harmonic Mean and Properties, Combined mean, Partition values- quartiles, percentiles, deciles.

Module II

Absolute and Relative measures of Dispersion - Range, Quartile Deviation, Percentiles, Deciles, Box Plot, Mean Deviation, Standard Deviation, Coefficient of Variation.

Correlation and Regression - Basic Concepts, Pearson Correlation Coefficient, Rank Correlation Coefficient, Regression equations (without derivation)

Module III

Idea of Permutations and Combinations, Probability Concepts - Random Experiment, Sample Space, Events, Probability Measure, Approaches to Probability - Classical, Statistical and Axiomatic, Addition Theorem (upto 3 evens) Conditional Probability, Independence of events, Multiplication theorem (upto 3 events), Total Probability Law, Baye's Theorem and its applications

Module IV

Index Numbers - definition, Simple Index Numbers; Weighted Index Numbers - Laspeyer'sPaasche's and Fisher's Index Numbers, Test of Index Numbers, Construction of Index Numbers, Cost of Living Index Numbers - Family Budget Method, Aggregate Expenditure Method. Time Series - Components of time series and measures of Trend.

Assignments

- 1. Diagrammatic and graphic representation using (excel/R) software(Bardiagram, pie chart. Histogram, ogives, e,t,c)
- 2. Correlation and regression, trend line using statistical soft wares,

Core Reference

- 1. S.P. Gupta: Statistical Methods (Sultan Chand & Sons Delhi).
- 2. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

Additional References

1. ParimalMukhopadhya: Mathematical Statistics, New Central Book Agency (p) Ltd, Calcutta

(15 Hours)

(20 Hours)

(20 Hours)

(17 Hours)

- Murthy M.N.: Sampling theory and Methods, Statistical Publishing Society, Calcutta.
 Agarwal: Basic Statistics

6. Statistics (complementary) courses for BSc Psychology

Semester	Title of the Course	Hours per Week	Credit	Marks		Total
				Internal	External	
Ι	BASIC STATISTICS	3	2	25	75	100
II	STATISTICAL TOOLS	3	2	25	75	100
III	STATISTICAL METHODS AND ELEMENTARY PROBABILITY	3	2	25	75	100
IV	STATISTICAL INFERENCE	3	2	25	75	100

Statistics (complementary) for BSc. Psychology

PROGRAMME OUTCOME			
	Critical Thinking: Take informed actions after identifying the assumptions that frame		
PO 1	our thinking and actions, checking out the degree to which these assumptions are		
r U I	accurate and valid, and looking at our ideas and decisions (intellectual, organizational,		
	and personal) from different perspectives.		
	Effective Communication: Speak, read, write and listen clearly in person and through		
PO 2	electronic media in English and in one Indian language, and make meaning of the word		
	by connecting people, ideas, books, media and technology.		
	Effective Citizenship: Demonstrate empathetic social concern and equity centered		
PO 3	national development, and the ability to act an informed awareness of issues and		
	participate in civic life through volunteering.		
	Environment and Sustainability: Understand the issues of environmental contexts and		
FU 4	sustainable development.		
PO5	Ethics: Recognise different value systems including your own, understand the moral		
103	dimensions of your decisions, and accept responsibility for them.		
DO 6	Global Perspective: Understand the economic, social and ecological connections that		
100	link the world's nations and people.		

PROGRAMME SPECIFIC OUTCOMES (PSOs)		
PSO1	Explain physiological process underlying behaviour.	
PSO2	Apply their knowledge of statistics for basic level data analysis.	
PSO3	Analyse psychological events on the basis of psychological processes and theories.	
PSO4	Demonstrate the knowledge and skill to specialise in major sub disciplines of psychology or in areas of management.	
PSO5	Work at grassroot level and identify/evaluate the psychological problems and devise basic level intervention.	
PSO6	Work under trained professionals and devise major research projects and major intervention programmes.	

SEMESTER-I 23U1CPSTP01 - BASIC STATISTICS

Credits: 2

Hours per week-3

ModuleI : Introduction to Statistics

Introduction to Statistics.Need and importance of Statistics in Psychology. Variables and attributes, Levels of Measurement: Nominal, Ordinal, Interval and Ratio. Collection of data-primary and secondary, census and sampling, classification and tabulation, grouped and ungrouped frequency table .Diagrammatical and graphical representation of data- bar diagram, pie diagram, frequency polygon and curve, histogram, ogives (15L)

Module II: Census and Sampling.

Different methods of sampling.Requisites of a good sampling method.Advantages of sampling methods.Simple random sampling, Stratifiedsampling.Systematic sampling. (10L)

Module III Research Methodology: An Introduction

Meaning of Research - Objectives of Research - Types of Research - Significance of Research -Research Methods versus Methodology - Research Process - Criteria of Good Research - Problems Encountered by Researchers in India- Ethical Principles in the conduct of research with human participants (15L)

Module IV Measures of central tendency- mean, median and mode- properties, merits and Demerits

(15L)

Core Reference:

Gupta.S.P., Statistical Methods. Sulthan Chand and Sons New Delhi. (Module I,II and IV)

Kothari, C.R. (2004). *Research methodology : Methods and techniques* (2nd revised edition). New Delhi: New Age International (P) Limited, Publishers. (Module III)

Additional References

1. Aron, A., Aron. R., & Coups, E. J. (2006).Statistics for Psychology. (4thed). New Delhi: Pearson Education (ISBN: 81-317-1464-20.

2. Mangal, S. K. (2002). Statistics in Psychology and Education. (2nded). New Delhi: Prentice-Hall of India Private Limited. (ISBN: 978-81- 203-8).

3. Hentry E Garett – Statistics in Psychology & Education

4. J.F. Guilford Fundamentals of Statistics in Psychology & EducationMcGraw-Hill

5. S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

6. Fundamentals of Statistics: DN Elhance, KitabMahal , Allahabad

	COURSE OUTCOMES
CO 1	Understand the origin, importance and functions of statistics and apply
	the scientific steps for a statistical investigation
CO 2	Understand and formulate the different sampling methods for collection
	of data
CO 3	Create tables, charts and graphs to express numerical information through
CO 4	Summarise and present huge mass of data by descriptive measures
CO 5	Understand the basics of methodology for psychological research

SEMESTER-II

23U2CPSTP02- STATISTICAL TOOLS

Credits: 2

Module I: Measures of dispersion

Range, quartile deviation, mean deviation, standard deviation-properties ,merits and demerits, coefficient of variation (15L)

Module II: Moments, Skewness and Kurtosis

Raw Moments, Central Moments, Inter Relationships (First Four Moments), Skewness – Measures – Pearson, Bowley and Moment Measure, KurtosisMeasures of Kurtosis – Moment Measure.

(13L)

Hours per week-3

Module III: Correlation and Regression

Karl Pearson's Coefficient of Correlation, Scatter Diagram, Interpretation of Correlation Coefficient, Rank Correlation, Regression Equation, Identifying the Regression Lines

(15L)

(12L)

Module IV: Defining the Research Problem

What is a Research Problem? - Selecting the Problem - Necessity of Defining the Problem - Technique

Involved in Defining a Problem

Core Reference:

Gupta.S.P., Statistical Methods. Sulthan Chand and Sons New Delhi. (Module I,II and III)

Kothari, C.R. (2004). *Research methodology : Methods and techniques* (2nd revised edition). New Delhi: New Age International (P) Limited, Publishers. (Module IV)

Additional References

- 1. Aron, A., Aron. R., & Coups, E. J. (2006). Statistics for Psychology. (4thed). New Delhi: Pearson Education (ISBN: 81-317-1464-20.
- 2. Mangal, S. K. (2002). Statistics in Psychology and Education. (2nded). New Delhi: Prentice-Hall of India Private Limited. (ISBN: 978-81- 203-8).
- 3. Hentry E Garett Statistics in Psychology & Education
- 4. J.F. Guilford Fundamentals of Statistics in Psychology & EducationMcGraw-Hill
- 5. S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- 6. Fundamentals of Statistics: DN Elhance, KitabMahal , Allahabad

	COURSE OUTCOMES
CO 1	Summarise and quantify the inherent variation in data using statistical
	measures and use it for comparison of populations
CO 2	Illustrate the fundamental characteristics regarding the shape of distributions
	using statistical measures
CO 3	Identify the type of correlation and apply different coefficients to measure the
	extent of liner relationship between variables
CO 4	Estimate the expected value of a related variable using the regression analysis
	when value of a related variable is given.
CO 5	Define a research problem scientifically for psychological research

SEMESTER-111

23U3CPSTP03 - STATISTICAL METHODS AND ELEMENTARY PROBABILITY

Credits: 2

Hours per week-3

Module I: Probability

Basic concepts, different approaches, conditional probability, independence, addition theorem, multiplication theorem (without proof) for two events, simple examples. (15L)

Module II: Random Variables and Probability Distributions

Random variables, Discrete and Continuous, p.m.f and p.d.f.,c.d.f of discrete r.v. Mathematical Expectation of a discrete r.v., Mean and Variance of a discrete r.v. (10L)

Module III: Standard distributions

Binomial distribution- mean and variance, simple examples.

Normal distribution -definition, p.d.f. simple properties, calculation of probabilities using standard normal tables, simple problems. (15L)

Module IV: Research Design

Meaning of Research Design - Need for Research Design - Features of a Good Design - Important Concepts Relating to Research Design - Different Research Designs - Basic Principles of Experimental Designs (15L)

Core Reference:

Gupta.S.P., Statistical Methods. Sulthan Chand and Sons New Delhi. (Module I,II and III)

Kothari, C.R. (2004). *Research methodology : Methods and techniques* (2nd revised edition). New Delhi: New Age International (P) Limited, Publishers. (Module IV)

Additional References

- 1. Aron, A., Aron. R., & Coups, E. J. (2006). Statistics for Psychology. (4thed). New Delhi: Pearson Education (ISBN: 81-317-1464-20.
- 2. Mangal, S. K. (2002). Statistics in Psychology and Education. (2nded). New Delhi: Prentice-Hall of India Private Limited. (ISBN: 978-81- 203-8).
- 3. Hentry E Garett Statistics in Psychology & Education
- 4. J.F. Guilford Fundamentals of Statistics in Psychology & EducationMcGraw-Hill
- 5. S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- 6. Fundamentals of Statistics: DN Elhance, KitabMahal , Allahabad

	COURSE OUTCOMES
CO 1	Use the concept of probability in decision making under uncertainty
CO 2	Estimating a-priori probabilities using Baye's theorem
CO 3	Identify the situation under which Binomial distribution can used for decision making under risk
CO 4	Identify the situation under which Normal distribution can used for decision making under risk
CO 5	Formulate a research design for conducting a psychological research

SEMESTER-IV

23U4CPSTP04 - STATISTICAL INFERENCE

Credits: 2

Hours per week-3

Module I: Testing of hypothesis

Statistical hypothesis, Simple and composite hypothesis Null and Alternate hypothesis, Type I and Type II errors, Critical Region, Size of the test, P value. (10L)

Module II: Large sample tests

z-tests for means, difference of means, proportion and difference of proportion, chi-square tests for independence, homogeneity. (15L)

Module III: Small Sample Tests

Normal tests for mean, difference of means and proportion (when σ known), t-tests for mean and difference of means (when σ unknown), paired t-test, test for proportion (binomial), chisquare test for variance, F-test for ratio of variances. (15L)

Module IV: Report Writing

Significance of Report Writing- Different Steps in Writing Report - Layout of the Research Report-Types of Reports- Oral Presentation - Mechanics of Writing a Research Report- Precaution for Writing Research Reports (15L)

Core Reference:

Gupta.S.P., Statistical Methods. Sulthan Chand and Sons New Delhi. (Module I,II and III)

Kothari, C.R. (2004). *Research methodology : Methods and techniques* (2nd revised edition). New Delhi: New Age International (P) Limited, Publishers. (Module IV)

Additional References

- Aron, A., Aron. R., & Coups, E. J. (2006). Statistics for Psychology. (4thed). New Delhi: Pearson Education (ISBN: 81-317-1464-20.
- Mangal, S. K. (2002). Statistics in Psychology and Education. (2nded). New Delhi: Prentice-Hall of India Private Limited. (ISBN: 978-81- 203-8).
- 3. Hentry E Garett Statistics in Psychology & Education
- 4. J.F. Guilford Fundamentals of Statistics in Psychology & EducationMcGraw-Hill
- 5. S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- 6. Fundamentals of Statistics: DN Elhance, KitabMahal , Allahabad

	COURSE OUTCOMES
CO 1	Understand the concept of Testing of Hypothesis and the procedures in testing
CO 2	Apply the concept of errors in testing procedures in test procedures
CO 3	Differentiate between Large sample test and small sample test and to use them for
	decision making in appropriate situations
CO 4	Apply the Chi square test for testing independence of two attributes
CO 5	Prepare a research report on a psychological study

7. Model question papers

Sacred Heart College (Autonomous) Thevara, Kochi

First Year B.Sc. Degree (C.B.C.S.S) Examination

First Semester - Statistics Course

23U1CPSTA01 23U1CRCSTA01- FUNDAMENTALS OF STATISTICS

(Common for B.Sc. Mathematics and Computer Applications)

Time: Three Hours

Maximum:75 Marks

Use of Scientific calculators and Statistical tables permitted

Part A

(Each question carries 2marks. Maximum marks from this part is 20).

- 1. Define quartiles of a distribution
- 2. What do you mean by an average? What are the positional averages?
- If each of the observations in a data is multiplied by 1/5, the mean of the observations becomes 3.
 What is the mean of the original set of observations?
- 4. If the sum of squares of deviations of the observations 12,14,20,16, 12, 20,19, 22, 25 and 20 is a minimum, write the number from which deviations are taken.
- 5. What do you mean by moments of a distribution?
- 6. Given the 2nd, 3rd, and 4th central moments 50,100 and 6600, find the measure of kurtosis?
- 7. What do you mean by secular trend?
- 8. If the regression coefficients of a bivariate data are 0.4 and 0.9 respectively, find the correlation coefficient between the variables
- 9. Define multiple correlation coefficients
- 10. If 3x + 2y = 8 and 4x 5y = 18 are the regression lines, find the angle between them.
- 11. What is a Scatter diagram?
- 12. Write the normal equations for fitting a straight line

Part B

(Each question carries 5marks. Maximum marks from this part is 25)

- 13. The first three moments about 2 are 1, 16 and -14 find the mean and variance?
- 14. Explain the various measures of skewness
- 15. If A,G,H are the arithmetic mean, Geometric mean and Harmonic mean of two numbers then show that A>G>H

- A student obtained the mean of 20 observations as 53. It was later discovered that he had wrongly copied an observation as 15 instead of 50 and another observation as 60 instead of 16. Calculate the correct mean and standard deviation of the data.
- 17. Derive the equation of fitting of a straight line
- 18. Calculate coefficient of skewness using quartile measure for the following data

x :	5	10	15	20	25	30	35
f :	4	38	65	90	70	42	6

 19.
 The following distribution gives the marks obtained by a group of students in Statistics.

 Marks
 : 0-9 10-19 20-29 30-39 40-49 50-59 60-69 70-79 80-89

 No.ofstudents : 3
 7
 13
 27
 40
 30
 16
 10
 4

Find the median and the 7th decile marks. Also find these values graphically.

20. What do you mean by rank correlation? Derive an expression for the rank correlation coefficient.

Part C

(Each question carries 10 marks. Maximum marks from this part is 30)

Explain kurtosis. The following is the wage distribution of a group of workers.
 Comment on the kurtosis of the distribution.

Wage(in dollars)	:	0-10	10-20	20-30	30-40	40-50	50-60
No.of persons	:	15	17	19	27	19	12

27. What do you mean by measures of dispersion? What are the uses of it? The following are the runs scored by two batsmen in some innings. Choose the batsman who is more consistent

Runs	Frequency				
	Batsman A	Batsman B			
0 - 20	3	5			
20 - 40	12	6			
40 - 60	25	20			
60 - 80	10	26			
80 -100	6	2			
100 -120	4	1			

28. Fit a se28. cond degree curve to the following data

x:	1	2 3	4	6	8	
y:	2.4	3.0	3.6	4.0	5.0	6.0

29. If 2x - 3y + 4 = 0 and 4y - 5x - 8 = 0 are the regression equations of a bivariate data, find (i) the mean values of x and y and (ii) the correlation coefficient between x and y. Also estimate y when x = 7

Sacred Heart College (Autonomous) Thevara, Kochi

Second Semester - Statistics (Core and Complementary) Course

23U2CPSTA02/23U2CRSTA02, -THEORY OF PROBABILITY AND RANDOM VARIABLES

(Common for B.Sc. Mathematics and Computer Applications)

Time: Three Hours

Maximum:75 Marks

Use of Scientific calculators and Statistical tables permitted

Part A

(. Each question carries 2 mark. Maximum marks from this part is 20)

- 1 Define exhaustive events
- 2 State multiplicative law of probability
- 3 Given P(A) = 0.4, P(B) = 0.3 and P(AUB) = 0.5, Find P(A/B)
- 4 If f(x) = k x for X = 1, 2, 3 is a probability distribution function (p.d.f.), find k
- 5 The distribution function of a random variable X is F(x). If F(3) = 0 and F(5) = 1, find F(2) and F(8)
- 6 If X and Y are two independent random variables with p.d.f. $h(x) = e^{-x}$ for x > 0 and g(y) = 1 for 0 < y < 1, find the joint distribution of (X,Y)
- 7 Define marginal distributions
- 8. What do you mean by secular trend?
- 9. Provide any one use of Time series analysis.
- 10. Write a simple price index number which satisfies the time reversal test.
- 11. Which weighted price index is suitable when the base period quantities are unknown?
- 12. Write any two uses of index numbers.

Part B

(Each question carries 5 marks. Maximum marks from this part is 25)

- 13. For three events A,B and C, prove that $P(A \cap B \cap C) \ge P(A) + P(B) + P(C) 2$
- 14. Four cards are selected at random from a pack of cards. Find the probability that
 - (a) there is at least one ace (b) there are exactly two aces (c) there are exactly two Kings and two Queens.
- 15. The p.d.f. of a r.v. X is given by $f(x) = (1/\sqrt{2\pi})e^{-(x^2/2)}$ for $-\infty < x < \infty$ Find the p.d.f. of $Y = X^2$
- 16. Out of 2n + 1 consecutively numbered tickets, three tickets are drawn at random. What is the probability that they are in Arithmetic Progression.
- 17. The following is the p.d.f. of ar.v. X

$$\begin{aligned} f(x) &= x & \text{for } 0 \leq x \leq 1 \\ &= 2 - x & \text{for } 1 \leq x \leq 2 \end{aligned}$$

Find the distribution function of X.

- 18. The p.d.f.of a r.v. X is given by $f(x) = k e^{-\theta x}$ for $x \ge 0$ and $\theta \ge 0$. Find k. Also show that $P[X \ge m + n / X \ge m] = P[X \ge n]$ where m > 0, n > 0
- 19. If f(x,y) = 2 for 0 < x < y < 1 is the joint p.d.f. of (X,Y), examine whether X and Y are independent.
- 20 Using the following data calculate the cost of living index for 2012 by taking 2008 as the base.

Items	Price(Rs.	per kg.)	Quantity		
	2008	2012	2008	2012	
Rice	20	30	8	5	
Wheat	12	15	4	4	
Sugar	24	32	3	2	
Coconut Oil	60	60	2	2	

Part C

(Each question carries 10 marks. Maximum marks from this part is 30)

- 21. In a group of students, 20% were considered to be intelligent, 60% as medium and the rest below average. The probability that a very intelligent student fails in a viva-voce examination is 0.05, the medium student failing has a probability 0.08 and the corresponding probability for a below student is 0.15. If a student is known to have passed the viva-voce examination, find the probability that he is below average
- 22. If f(x,y) = (1/72)(2x+3y) for x = 0,1,2 and y = 1,2,3 is the joint p.d.f. of (X,Y), find the conditional distribution of Y given X = 0
- Explain the method of moving averages. Calculate the trend of the following data using a 3yearly moving average

Years: 2	001	2002	2003	2004	2005	2006	2007	2008	2009	2009
Price :	12	13	15	16	19	22	18	15	17	16

24. Using the following data estimate the value of X when Y=13 and Z=40

X:	20	25	30	35	40	45	50	55
Y:	16	14	11	12	15	14	12	12
Z:	50	58	61	62	42	41	58	62

Sacred Heart College (Autonomous) Thevara, Kochi

Third Semester - Statistics (Core and Complementary) Course

23U3CPSTA03/23U3CRSTA03 - THEORY OF DISTRIBUTIONS

(Common for B.Sc. Mathematics and Computer Applications)

Time: Three Hours

Maximum:75 Marks

Use of Scientific calculators and Statistical tables permitted

Part A

(Each question carries 2 mark. Maximum marks from this part is 20)

- 1. State addition theorem on expectation
- 2. What moment generating function?
- 3. Let X be a random variable with the p.d.f. f(X) = x/6 when X=1,2,3 and zero elsewhere. Find $E(X+2)^2$
- 4. Define lognormal distribution?
- 5. If x is N (5, 3) find the distribution of Y=2X+5.
- 6. Define Beta distribution of second type. Obtain its relation with beta distribution of the first kind.
- 7. IfXfollowsbinomialdistributionwithparameternandp,findthedistributionofY=n-X
- 8. State Bernoulli's law?
- 9. What do you mean by convergence in probability?
- 10. What is population parameter?
- 11. Distinguish parameter and statistic?
- 12. Give a statistic that follow chi-square distribution?

Part B

(Each question carries 5marks. Maximum marks from this part is 25)

- Find the m.g.f. of binomial distribution? Derive Poisson distribution as a limiting case of binomial distribution
- 14. What is stratified sampling? What are the advantages of this sampling?
- 15. The first four moments of a distribution about 4 are 1,4,10 and 45 respectively. Show that the mean is 5 and variance is 3, $\mu_3 = 0$ and $\mu_4 = 25$.
- 16. Definelackofmemoryproperty.Showthatgeometricdistributionpossessesthisproperty
- 17. Show that Q.D.:M.D.:S.D.: =10 :12: 15 . for a normal random variable with mean μ and s.d. σ
- 18. IfXfollowsthestandardexponentialdistributionshowthatP[X-1>2]<14.Also compute the actual probability.
- 19. State the interrelation among Normal, Chisquare 't' and 'F' distribution.
- ${\it 20.} \qquad The following results we reobtained when 100 batches of seeds we real lowed to$

germinate on a damp filter paper in a laboratory $\beta_1=1/15$ $\beta_2=89/30$. Determine the binomial distribution and calculate the frequency for X=6 and p>q.

Part C

(Each question carries 10 marks. Maximum marks from this part is 30)

- 21. Find the correlation coefficient between X and Y given that f(XY)=X+Y for 0 < X < 1; 0 < Y < 1
- 22. Derive the recurrence relation for central moments for Binomial distribution. Hence obtain Their skewness and kurtosis.
- 23. (i)State and prove Lindberg levy form of central limit theorem (ii) A scientist desires to estimate the mean of a population using a sample sufficiently large, such that the probabilitywillbe0.99thatthesamplemeanwillnotdiff erformthepopulationmean bymorethath25% of the standard deviation. How large thesize of the sampleshould be?
- 24. Define(1)Statistic(2)sampling error(3) Standard error. Also derive the sampling distribution of the sample mean drawn from a normal distribution.

Sacred Heart College (Autonomous) Thevara, Kochi Fourth Semester - Statistics (Core and Complementary) Course 23U4CPSTA04/23U4CRSTA04 –Statistical Inference (Common for B.Sc. Mathematics and Computer Applications) Use of Scientific calculators and Statistical tables permitted

PART A

(Each question carries 2 mark. Maximum marks from this part is 20)

- 1. Define parameter and statistic using examples.
- 2. Write the formula for finding the confidence interval for mean when sample size is small.
- 3. What is point estimation?
- 4. Define null and alternative hypotheses with examples.
- 5. What do you mean by a statistical test?
- 6. Define critical region of a test statistic.
- 7. Write an unbiased estimate of population mean.
- 8. Write the limiting condition for consistency of an estimator.
- 9. State Cramer-Rao inequality.
- 10. Distinguish simple and composite hypothesis.
- 11. State Neyman condition for sufficiency?
- 12. The diameter of cylindrical rod is assumed to be normal with a variance of 0.04cm.A sample of 50 rods has a mean diameter of 4.5cm. Find the 95% confidence limits for population mean.

PART B

(Each question carries 5 marks. Maximum marks from this part is 25)

- 13. Distinguish (i) ype I and type II errors.(ii) significance level and power of the test.
- 14. Define In two large populations there are 30% and 25% respectively of fair haired people. Is this difference likely to be hidden in sample of 1,200 and 900 respectively from the two populations? Use 5% level of significance
- 15. Explain the method of moments. Estimate the parameter λ of the exponential distribution

 $f(x) = \lambda e^{-\lambda x}$, $0 \le x \le \infty$, by the method of moments.

16. Define sufficiency of an estimator and state the Fisher –Neyman factorization theorem.

- 17. Find the maximum likelihood estimate of the parameters μ and σ^2 of Normal distribution.
- 18. What do you mean by parametric and nonparametric tests?
- 19. Explain chi-square test of goodness of fit.
- 20. In a certain district A, 450 persons were considered regular consumers of tea out of a sample of 1000 persons. In another district B, 400 were regular consumers of tea out of a sample of 800persons .Do these facts reveal that a significant difference between the two districts ,as far as tea drinking habits concerned.

PART C

(Each question carries 10 marks. Maximum marks from this part is 30).

- 21. i) Give an example of an estimate which is consistent but biased.ii)Derive the 95% confidence limits for the proportion of binomial population.
- 22. i) Describe the t-test for testing the equality of two means stating the assumptions involved based on dependent samples.
 - ii). The sales data of an item in six shops before and after a special promotional campaign

are as follows. Can the campaign be judjed to be a success?

Shops	А	В	С	D	E	F
Before campaign	53	28	31	48	50	42
After campaign	58	29	30	55	56	45

- 23 i) Explain the F test for testing equality of population variances.
 - ii) Two horses A and B tested according to the time(in seconds) to run a particular track with the following results.

Horse A 28 30 32 33 33 29 34 Horse B 29 30 30 24 27 29

Test whether the two horses having the same running capacity.

24. i) Briefly explain the concept of ANOVA.

ii) A manufacturing company has purchased three new machines of different makes and wishes to determine whether one of them is faster than the others in producing a certain output.

Five hourly production figures are observed at random from each machine and the results are as follows. Determine whether the machines are significantly different in their mean speeds.

Machine A	Machine B	Machine C
25	31	24
30	39	30
36	38	28
38	42	25
31	35	28

Sacred Heart College (Autonomous) Thevara, Kochi

Fourth Semester - Statistics (Core Course)

23U4CRSTA05 - SAMPLE SURVEY ANALYSIS AND DESIGN OF EXPERIMENTS

(For BSc. Computer Applications)

Time: Three Hours

Maximum:75 Marks

Use of Scientific calculators and Statistical tables permitted

PART A

(Each question carries 2 mark. Maximum marks from this part is 20)

- 1. Define sampling unit.
- 2. What do you mean by population?
- **3**. What is meant by quota sampling?
- 4. What are the main sources of non sampling errors?
- 5. What do you mean by stratified random sampling?
- 6. What is the model used in two way classified data?
- 7. State the assumptions used in ANOVA
- 8. Define experimental error.
- 9. What are the limitations of LSD?
- 10. Define randomization.
- 11. What is experimental unit?
- 12. What is the model used for one way classified data?

PART B

(Each question carries 5 marks. Maximum marks from this part is 25)

- 13 Explain any two methods to draw a simple random sample..
- 14. Write the analysis of CRD
- 15. What are the principles of stratification in stratified sampling? Explain each briefly.

16. In SRSWOR, S.T the probability of a specified unit of a population of N units being included in Sample of size n is-

- 17. Suggestanunbiasedestimatorofthepopulationproportion.Writedowntheexpressionforits variance.
- 18. Derive the efficiency of RBD compared to CRD.
- 19. Briefly explain the analysis of three way classified data.
- 20. Discuss the advantages and disadvantages of RBD.

PART C

(Each questions carries 10 marks. Maximum marks from this part is 30.)

- 21. Explain in detail the various steps in a sample survey.
- 22. S.T in SRSWOR, sample mean is the best unbiased estimate of the population mean.

- 23. Derive the analysis of variance of LSD.
- 24. An experiment was carried out to determine the effect of claying the ground on the field of barley grains, amount of clay used were as follows
 - a. Noclay
 - b. clay at 100 peracre
 - c. clay at 200 peracre
 - d. clay at 300 peracre.

The yields were in plots of 8 metres and are given in following table.

colu mn → $Row \downarrow$	Ι	Π	III	IV	Row totals
Ι	D	В	С	А	
	29.1	18.9	29.4	5.7	83.1
II	С	А	D	В	
	16.4	10.2	21.2	19.1	66.9
III	А	D	В	С	
	5.4	38.8	24.0	37.0	105.2
IV	В	С	А	D	
	24.9	41.7	9.5	28.9	105.0
Column totals	75.8	109.6	84.1	90.7	360.2

Perform the ANOVA and calculate the critical difference for the treatment mean yields.
Fifth Semester - Statistics (Core Course)

23U5CRSTA06 – STATISTICAL QUALITY CONTROL AND OPERATIONS RESEARCH

(For BSc. Computer Applications)

Time: Three Hours

Maximum:75 Marks

Use of Scientific calculators and Statistical tables permitted

PARTA

(Each question carries 2mark. Maximum marks from this part is 20)

- 1. Explain degeneracy
- 2. When do you say that a transportation problem is unbalanced?
- 3. Explain a loop in transportation table.
- 4. State one application of OR.
- 5. Define a fair game.
- 6. Distinguish between *p*-chart and *np*-chart.
- 7. Explain warning limits.
- 8. Define a defect.
- 9. Name a control chart which can be used to control the variability.
- 10. Define consumer's risk.
- 11. Define saddle point in Game theory
- 12. Define Statistical quality control.

PARTB

(Each question carries 5marks.Maximum marks from this part is25)

- 13. Distinguish between transportation problem and assignment problem.
- 14. Explain the role of control charts in SQC.
- 15. Give out line of simplex method in linear programing.
- 16. Solve the following LPP by the graphical method

Maximize Z = 5x1 + 7x2Subject to

*x*1+*x*2≤4,3*x*1+8*x*2≤24,10*x*1+7*x*2≤35,*x*1,*x*2≥0

17.Solvethefollowinggamewhosepayoffmatrixigivenbelow.

	FirmB							
		B1 B2 B3 B4 B						
	A1	3	-1	4	6	7		
	A2	-1	8	2	4	12		
FirmA	A3	16	8	6	14	12		
1 11111 1	A4	1	11	-4	2	1		

18. Give any three reasons for the popularity of control charts

19 If all points in an X hart falls with in the control limits, can we conclude that the process is in control. Describe the theoretical reasoning of the same.

20 Thirty samples each of size seven have been collected to establish control over a process. The following data were collected. $\sum 30\overline{Xi} = 2700$ and $\sum 30 Ri = 120$. Calculate the trial control limits of \overline{X} chart and R chart. Also estimate the process standard deviation, by assuming that R- chart is in control.(for n=7, A2= 0.419, D3= 0.076, D 4= 1.924, d2 = 2.704

PART C (Each question carries 10 marks. Maximum marks from this part is 30)

21. Solve the LPP using simplex method:

 $Max: Z = 16x_1 + 17x_2 + 10x_3$ Subject to: $x_1 + x_2 + 4x_3 \le 2000$, $2x_1 + x_2 + x_3 \le 3600$, $x_1 + 2x_2 + 2x_3 \le 2400$, $x_1 \le 30$ $30andx_1, x_2, x_3 \ge 0$

22. A manufacturer has distribution centers at X, Y and Z. These centers have

availability40,20,and40 units of his product. His retail outlets at A, B, C, D and E require

10,20,30,and15unitsrespectively. The transport cost (in rupees) per unit between each center

outlet is given below

Distribution	Retail outlet								
	A	A B C D E							
Х	55	30	40	50	40				
Y	35	30	100	45	60				
Z	40	60	95	35	30				

Determine the optimal distribution to minimize the cost of transportation.

23. Discuss the statistical basis of control chart technique. Explain in detail and *R* charts.

24. Using the following data, construct a suitable control chart.

D		
Day	No. inspected	No .of defectives
1	196	39
2	210	25
3	210	28
4	210	43
5	210	15
6	174	6
7	180	14
8	196	3
9	181	10
10	184	25
11	130	15
12	190	6
13	130	22
14	130	8
15	196	8
16	208	9
17	204	5
18	210	5
19	180	7
20	180	15

B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2022 SEMESTER – 6: COMPUTER APPLICATION (STATISTICS) COURSE: 19U6CRCST7 – COMPUTER AIDED DATA ANALYSIS USING EXCEL AND R STUDIO

(Common for Regular 2019 Admission)

Time: Three Hours

Max. Marks: 75

$\mathbf{PART} - \mathbf{A}$

(Each question carries *five* marks, maximum marks from this part is 25)

- 1. How we import data from excel to R?
- 2. Write a short note on lists and data frames in R?
- 3. Differentiate between scan () and c (), functions in R?
- 4. Give the codes to draw a pie diagram and histogram in R?
- 5. What are the advantages of using packages in R?
- 6. Explain how you can perform chi-square test in MS Excel?
- 7. List any two advantages and disadvantages of R over MS Excel
- 8. Mention how you can produce correlation and regression in Excel and R?

PART – B

(Each question carries *ten* marks, maximum marks from this part is 50)

9. Compute the first four moments about mean for the following distribution using MS Excel. Also calculate β_1 and β_2 .

X	1	2	3	4	5	6	7	8	9
F	1	6	13	25	17	22	9	5	2

- 10. Create the sequence 102, 107, 112, ..., 152 in Excel. And read that data in R and compute its mean and variance.
- 11. A personality test was conducted on a random sample of 10 students from a large university and the following scores were reported, 35, 60, 55, 50.5, 44, 41.5, 47.5, 49, 53.5, 50. Test if the average "personality test score" for the university students is 50, at 5% level of significance.
- 12. Obtain the equations of two lines of regression for the following data. Also obtain the estimate of X for Y = 70. (Using R)

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

13. To test the efficiency of sleeping pills, a drug company uses a sample of insomniacs. The time inminutes until falling asleep is observed for each of them. Few days later, the same persons are given a sleeping pill and the time until falling asleep is measured again. The measurements are given below.

1	Λ	
+	-	•

Persons	А	В	С	D	E
No pills	65	35	80	40	50
With pills	45	15	61	31	20

Test whether the sleeping pills are effective. (Using R software)

15. In an experiment on immunization of 22 human beings from cholera, the following results wereobtained. Draw your inference in the efficiency of the vaccine. Test ay 5% level of significance.

	Died	Survived
Inoculated	2	10
Not Inoculated	6	4

16. The following samples are from two independent normal populations. Test the hypothesis that they have the same mean assuming that the variance is equal by taking the level of significanceas 1 % (Using MS excel)

Sample 1	14	18	12	9	16	24	20	21	19
Sample 2	20	24	18	16	26	25	18		

SACRED HEART COLLEGE, THEVARA Third Semester

B.CA. Degree (CBCSS) Examination

Basic Statistics

Time: 3 Hrs

Maximum Marks:75

Use of Scientific calculators and Statistics tables permitted

PART A

Answer All questions. Each question carries 1 mark.

- 1. Distinguish between probability sampling and non-probability sampling
- 2. What is classification and tabulation?
- 3. Define conditional probability?
- 4. Define quartile deviation.
- 5. Find the mean deviation about the mean for the set of values 5,10,15,20 and 25.
- 6. Distinguish between pictograms and cartograms?
- If A and B are two independent events such that P(A) =0.5, P (A U B) = 0.6, Determine P(B).
- 8. State multiplication theorem of probability of any two events.
- 9. Explain the Time Reversal test for index numbers
- 10. Distinguish between simple and weighted index numbers

PART B

Answer any eight questions each question carries 2 marks

- 11. P (AUB) =5/6, P (A \cap B) =1/3 P(A') =1/2. Determine P (A) and P (B). Are A and B are independent
- 12. Explain the advantage of sampling over census
- 13. Distinguish between Primary are Secondary data with example
- 14. Calculate 7th decile for the following data: 21,30,27,36,12,41,15,97,84
- 15. What is stratified sampling?
- 16. Define complimentary events
- 17. Income distribution of 100 families are given. Which measure of central tendency will you prefer to find the average income? Why?
- 18. What is a Pie-diagram?
- 19. If the sum of the current year price and base year prices of a set of commodities are $\sum P_k = 360$ and $\sum P_0 = 300$ respectively, find the simple aggregate index number.
- 20. What are the uses of Index numbers?
- 21. State multiplication theorem on probability.
- 22. How will you construct stem and leaf chart

PART C

Answer any five questions each carries 5 marks

- 23. Given P(A)=P(B)=P(C)=0.4, $P(A\cap B) = P(A\cap C) = P(B\cap C)=0.2$, $P(A\cap B\cap C) = 0.1$. Find the probability of (i) at least one of the events occur (ii) exactly one of the events occur (iii) exactly two of the events occur.
- 24. Define coefficient of variation? Two batsmen A and B have the following scores in a series of matches.

A: 74	101	4	82	6	71	14	0	77
B: 72	5	81	97	22	11	16	1	88

Compare A and B for average and variability of scores.

- 25. Explain the method of constructing a cost of living index numbers
- 26. State and prove addition theorem for three events Explain the terms with example (1) Independent events (2) equally likely events (3) exhaustive events.
- 27. Represent the following data of number of deaths from road accidents in a city in different years by a multiple bar diagram

Years	2000	2001	2002
No.of accidents	1017	912	845
No. of deaths	332	357	389

28. The median of the following distribution is 167.5. Find the missing frequency.

Height	158-161	162-165	166-169	170-173	174-177	178-181
in						
(c.m.)						
No.of	11	23	32		12	4
workers						

29. State and prove addition theorem on probability of two events .Given P (A) = 0.3 P (B) = 0.4 P(C) = 0.5 and P (A \cap B') = 0.2 P (B \cap c) = 0.3. Find the P (B'/c') and P (A/B).

PART DAnswer any two Questions each carries 12 marks

30. (a)What is thesignificance of relative measures of dispersion? (b) Define (1) the coefficient of quartile deviation (2) the coefficient of variation. (c) In a cricket season batsman A Gets an average score of 64 runs per innings with standard deviation of 19 runs, while batsman B gets an average score of 43 runs with standard deviation of 9 runs in an equal number of innings. Discuss the efficiency and consistency of both the batsman.

commodity	Price (in Rs.	.per Unit)	Number of Units		
	Base period	Current Period	Base period	Current Period	
А	6	10	50		
В	2	2	100		
С	4	6	60		
D	10	12	30	24	
Е	8	12	40	36	

31. Calculate the Laspeyres, Paascje's and Fisher's Index Numbers for the following data

32. (a)State the Baye's theorem of probability

(b) The chance that doctor A will diagnose a disease X correctly is 60%. The chance that a patient will die by his treatment after correct diagnosis is 40%. The chance of death by wrong diagnosis is 70%. A patient of doctor A, who had disease X, died. Find the probability that disese was diagnosed correctly.

33. Calculate the arithmetic mean and standard deviation for the following data:

Age in	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
years								
No.of	8	7	15	18	22	14	10	6
persons								

B. Sc. DEGREE END SEMESTER EXAMINATION SEMESTER –I: Complementary course for Psychology 23U1CPSTP01 - BASIC STATISTICS

Time : Three Hours

Max. Marks: 75

PART A

Answer all questions (Each question carries one mark)

- 1. In Plural sense, the word statistics means
- 2. The word statistics was originated from the Italian word
- 3.defined Statistics as the science of averages
- 4. The method of collecting data from every unit of population is called
- 5. Religion is a characteristic measured using scale of measurement
- 6.can be used for finding mode graphically
- 7. When various observations do not have equal importance, we calculate
- 8. The Arithmetic mean of the first 10 natural numbers is
- 9. Insampling all the observations have an equal chance of inclusion in the sample

10.research is undertaken to solve an immediate practical problem

PART B

Answer any eight of the following questions (Each question carries two marks)

- 11. Give any two misuses of statistics
- 12. Distinguish between variables and attributes.
- 13. Distinguish between schedule and questionnaire.
- 14. Define secondary data
- 15. Define a two way table
- 16. Define systematic sampling
- 17. The mean of a set of 10 observations is calculated as 25. If one more observation whose value is 25 is included in the set of data, find the new value of arithmetic mean
- 18. What is the assumption made for calculating mean from grouped frequency distribution?
- 19. Define median

20. Give any two objectives of research

PART C Answer any five of the following questions (Each question carries five marks)

21. Briefly explain the uses of statistics in Psychology.

22. What are the advantages of sampling over census?

23. What are the different types of classification

24. Draw a suitable bar diagram to represent the following data giving the number students in different colleges for various programs

Course of study	College A	College B	College C
Arts	125	150	200
Humanities	180	190	240
Science	225	140	120

25. How can we draw a frequency polygon for a grouped frequency distribution?

26. Explain how you will you find median graphically.

27. Briefly explain the criteria of a good research.

PART D

Answer any two of the following questions (Each question carries twelve marks)

28. Draw the og	gives and estin	nate the value o	f median graph	ically		
Class:	Class: 0 - 10		20 - 30	30 - 40	40 - 50	
50 -	60					
Frequency:	12	17	25	24	19	
15						
29. Calculate A	rithmetic mea	n from the foll	owing data			
Class:	10 - 19	20 - 29	30 - 39	40 - 49	50 –	59
60 -	69					
Frequency:	17	23	36	34	29	
21						

30. What are the different types of bar diagrams? Briefly explain their uses.

31. What are the different types of research? Give the characteristics of each type.

B. Sc. DEGREE END SEMESTER EXAMINATION SEMESTER –II: Complementary course for Psychology 23U2CPSTP02 STATISTICAL TOOLS

Time : Three Hours

Max. Marks: 75

PART A

Answer all questions (*Each question carries one mark*)

- 1. The difference between the largest and smallest observations is called the
- 2. The Square of standard deviation is called
- Coefficient of variation is ameasure of dispersion. 3.
- 4. Moments measured fromare called central moments
- 5. Skewnesss deals with
- 6. A flat curve is calledcurve
- 7. Correlation deals withbetween variables
- 8. If two variables are uncorrelated, then covariance between them is
- 9. The two regression lines coincide when

(1*10=10)

PART B

Answer any eight of the following questions (Each question carries two marks)

- 11. Define the first quartile.
- 12. Define mean deviation.
- 13. Define relative measure of dispersion
- 14. Define Karl Pearson's coefficient of skewness
- 15. Sketch the rough shape of symmetric, positively skewed and negatively skewed curves.
- 16. How will you distinguish the Kurtosis of frequency distribution using beta values?
- 17. Define scatter diagram.
- 18. Define rank correlation.
- 19. Find the correlation coefficient if $\Sigma(X \overline{X})(Y \overline{\Box}) = 2704$, $\Box(X \overline{X})^2 = 5398$,

$$(Y - \bar{Y})^2 = 2224$$

20. What is a Research Problem?

(2*8=16)

PART C

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

- 21. What are the desirable properties of a good measure of dispersion?
- 22. Calculate the Quartile deviation from the following data

13, 15, 23, 32, 18, 11, 56, 45, 67, 32, 43, 76, 56, 89, 99, 34, 45, 50, 60

23. Calculate the mean deviation from Mean for the following data

18 27 23 28 34 20

- 24. Differentiate between absolute and relative measures of skewness? Give example for each.
- 25. The first three raw moments of a distribution about zero are 3, 24 and 76 respectively. Comment on skewness of the distribution.
- 26. Distinguish between direct and indirect correlation. Give examples of pairs of variables having the two types of correlation between them.
- 27. What are the technique Involved in Defining a Problem?

(5*5=25)

PART D

(Answer **any two** of the following questions.*Each question carries twelve marks*) 28. Calculate the Standard deviation from the following data

Class:0 - 1010 - 2020 - 3030 - 4040 - 5050 - 60Frequency:26121064

29. The following data is available on a data sheet. Comment on the Kurtosis of the distribution.

n = 100, $\Sigma f x = 45$, $\Sigma f x^2 = 873$, $\Sigma f x^3 = 891$, $\Sigma f x^4 = 20493$. Comment on the Kurtosis of the distribution.

- 30. Calculate the correlation coefficient between mark in Mathematics and English. Mark in Mathematics: 18 15 27 32 22 32 43 48 40 Mark in English: 32 30 40 30 30 25 50 25 50
- 31. The two regression lines are 8x 3y + 30 = 0 and 10x 3y 50 = 0Find (1) Mean value of X and Y (2) Value of Y when X = 6 (3) Value of X

when Y = 10

(2*12=24)

B. Sc. DEGREE END SEMESTER EXAMINATION SEMESTER –III: Complementary course for Psychology 23U3CPSTP03- STATISTICAL METHODS AND ELEMENTARY PROBABILITY

Time : Three Hours

Max. Marks: 75

PART A

Answer all questions (*Each question carries one mark*)

- 1. The set of all outcomes of a random experiment is called
- 2. If A and B are two mutually exclusive events, then $P(A \cap B) = \dots$
- 3. Probability of getting one red ball and one blue ball when two balls are drawn from a box containing 8 red balls and 7 blue balls is
- 4. The probability of getting 4 Spade cards when 4 cards are drawn from a well shuffled packet of 52 cards is
- 5. For any two events A and B, $P(A \cap B) = \dots$
- 6. The number of petals in a flower is an example ofrandom variable.
- 7. If X is a discrete random variable with probability mass function given by $f(x) = \frac{x}{r_{e}}$ where $x = 0, 1, 2, 3, 4, \dots, 10$, the value of $P(X = 2.5) = \dots$
- 8. The mathematical expectation of a random variable gives thevalue of the random variable
- 9. The variance of a Binomial distribution with parameters n and p is
- 10. Measure of skewness is for normal distribution

$(1 \times 10 = 10)$

PART B

Answer any eight of the following questions (Each question carries two marks)

- 11. Define random experiment
- 12. Write down the sample space when 3 coins are tossed and faces turning up are observed
- 13. State the addition theorem of probability for three events
- 14. Define conditional probability
- 15. What is the probability of having 53 Sundays in a randomly selected leap year
- 16. Define a random variable.
- 17. Define Mathematical expectation of a discrete random variable

- 18. Find the probability of getting a success when the mean and variance of a Binomial distribution are 3 and 2 respectively.
- 19. Define standard normal distribution.
- 20. What is a research design?

(2 x 8=16)

PART C

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

- 21. Briefly explain any two approaches to probability.
- 22. State and prove the addition theorem of probability.
- 23. A speaks the truth in 80% of the cases and B in speaks the truth in 70% of the cases. In describing a certain incident which they have witnessed, what is the probability that
- (a) Both of them speak the truth
- (b) Both of them do not speak the truth.
- 24. Differentiate between discrete and continuous random variables.
- 25. Write down the probability distribution function of the random variable representing the sum of numbers when two dice are thrown at a time.
- 26. A survey showed that 70% of the workers in a company are satisfied with working conditions. If 8 workers are selected at random, what is the probability that
- (a) All are satisfied with working conditions
- (b) No one is satisfied with the working conditions
- 27. Briefly explain the Different Research Designs

(5 x 5=25)

PART D

Answer any two of the following questions (*Each question carries twelve marks*)

28. (a) State and prove the Baye's Theorem.

(b) There are three class rooms labelled R1, R2 an R3. There are 12 boys and 15 girls in room R1, 16 boys and 10 girls in room R2, 15 boys and 15 girls in room R1. One person was selected from a randomly chosen room and the person selected was found to be a boy. What is the probability that the person was selected from the Room R3?

29. The probability density function of a discrete random variable is given below

X: 0 1 2 3 4 5 6 7 8 9 10 26k F(x): k 3k 7k 17k 31k 28k 19k 2k 10k k Calculate the following

- (a) The value of k
- (b) $P(2 < X \le 5)$
- (c) P(X > 7)
- (d) P (X \leq 3)
- 30. What are the features of a good research design?
- 31. The life of electric bulbs follows a normal distribution with mean life of 3600 hours and standard deviation of 1000 hours. What is the probability that life of a randomly selected bulb is
- (a) Between 3000 and 4000 hours
- (b) More than 5000 hours
- (c) Less than 2000 hours

(2 x 12=24)

B. Sc. DEGREE END SEMESTER EXAMINATION SEMESTER –IV Complementary course for Psychology 23U4CPSTP04– STATISTICAL INFERENCE

Time : Three Hours

PART A

Max. Marks: 75

Answer all questions (*Each question carries one mark*)

- 1. The hypothesis which is accepted when the null hypothesis is rejected is called thehypothesis
- 2. The probability of type I error is called the
- 3. The distribution of sample statistic is called
- 4. The probability of rejecting the null hypothesis when it is false is called
- 5. In a test procedure, the value of test statistic was obtained as 2.36 and the critical value for the selected level of significance was 2.58. Then the null hypothesis is
- 6.distribution is used for testing the equality of two population means using small samples with known population standard deviations.
- 7. The test statistic used for testing the hypothesis concerning variance of a population follows distribution.
- 8. F test is used for testing the equality of two
- 9. The degrees of freedom for testing the independence of two attributes when the observed frequencies are in a table of m rows and n columns is
- 10. For a 2 x 2 contingency table with observed frequencies 12, 15, 10 and 20, the value of Chi-square test statistic for testing independence is

(1 x 10=10)

PART B

Answer any eight of the following questions (*Each question carries two marks*)

- 11. Define Null hypothesis
- 12. Define Type II error
- 13. Define statistic.
- 14. Define rejection region.

- 15. A manufacturer of electric bulbs claims that the mean life of the bulbs is 2000 Hours. Formulate the hypothesis to test the claim of the manufacturer.
- 16. Out of 1200 people from a city, 940 have the habit of smoking. Test whether proportion of smokers is 75%. (Table value for 5% level of significance is 1.65)
- 17. Briefly explain paired sample t test.
- 18. What are the uses of chi-square distribution in testing of hypothesis?
- 19. Define degrees of freedom.
- 20. Give the statistic used for testing equality of variances of two populations.

 $(2 \times 8 = 16)$

PART C

Answer any five of the following questions (Each question carries five marks)

- 21. Distinguish between simple and composite hypothesis
- 22. Briefly explain the steps involved in hypothesis testing.
- 23. Briefly explain how you will test the hypothesis concerning proportion of units possessing a characteristic in a population.
- 24. The mean life of 24 scooter tyres was found to be 24910 Hours with a standard deviation of 2250 Hours. Can it be regarded as a sample from a population having mean life of 25000 Hours. (Assume significance level of 5%)
- 25. A sample of 80 students from College A and 120 students from College B were given a test to assess the preparedness for higher education. The mean score of students from College A was found to be 132 while it was 137 for students from College B. Assuming a standard deviation of 22 for preparedness score of students, test whether students of both the Colleges are having same level of score at 5% level of significance.
- 26. In a random sample of 600 men and 700 women from a city 400 and 440 women are found to be in favour of new policy. Do the data indicate at 5% level of significance that the proportion of men and women differ significantly in their attitude towards the new policy?

27. The marks of 10 students are recorded below.

70, 120, 110, 101, 88, 83, 95, 107, 100, 98. Do the data support the assumption that mean mark of students in the college is 100?

(5 x 5=25)

PART D

Answer any two of the following questions

Each question carries twelve marks

- 28. Explain how you will test the equality of two population means when
- (a) The sample sizes are large and population variances are known
- (b) The sample sizes are small and population variances are not known
- 29. The distance travelled by of 8 males and 10 females to reach the office from home are given below. Test whether the mean distance travelled by males is significantly higher that of females.

Distance travelled in Kilometers											
Males:	70,	85,	90,	75,	80,	60,	65,	65			
Females:	60,	60,	75,	70,	65,	60,	55,	65,	70,	60	

30. A psychometric test was administered to 10 students to assess the mental strength before and after a training programme. The results are given below. Test whether the mental strength increased significantly after training.

I Q											
Before training:	46,	57,	49,	64,	50,	56,	42,	54,	60,	50,	
After training:	49,	63,	45,	72,	54,	60,	48,	54,	56,	51	

31. (a) Explain in detail the layout of a good Research Report?

(c) Explain the different types of research reports.

(2 x 12=24)