PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

(An Autonomous,NAAC accredited with 'A' Grade (3.17 CGPA)& ISO certified Institution)

BOARD OF STUDIES
2023-2024

DEPARTMENT
OF
STATISTICS

INDEX

DEPARTMENT OF COLLEGIATE EDUCATION GOVERNMENT OF ANDHRA PRADESH
PROCEEDINGS OF THE PRINCIPAL, PITHAPUR RAJAH's GOVT. COLLEGE [A]:: KAKINADA
Present: Dr. B.V. TIRUPANYAM, Ph.D.

Rc.No.1/ A.C/BOS/2023-24 Dt.29 Aug2023

Sub: P.R.G.C[A] – Academic Cell - **Conduct of BOS Meetings for the Academic Year 2023-24** – Guidelines issued - Regarding.

Ref: Resolutions adopted in 25th Staff Council Meeting held on 29 Aug 2023

The Autonomous colleges are, as per its vision, mission, stated objectives and core values, mandated to design and develop their own outcome -based curricula keeping in view the societal, local and global industry requirements, employability and industry – ready and transferable skills duly prescribing Course Outcomes (COs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) and suitable learning outcome assessment management system through robust and transparent evaluation system to measure their attainment levels by the students.

The Sustained Developmental Goals (SDG-4) of UNEP recommended assurance of quality to students in HEIs promoting creativity, critical thinking and collaborative skills, while building curiosity, courage, resilience and gender equality among students.

Further, the NEP-2020 recommended that the HEIs shall equip students with such skills that translate them into leaders and potential entrepreneurs too besides credit transfer mechanism through ABC (Academic Bank of Credits).

The HEIs are also, as per the Revised Accreditation Framework [RAF] of NAAC, endowed with the responsibility of rolling out quality and holistic human resources to the modern Indian Economy by ingraining quality in teaching- learning process by facilitating the students experience a wide range of participative and experiential learning strategies including field trips, conferences, integration of technology, community service programmes, career guidance, certificate and value added courses, research and inquisition based teaching, exchange programmes, gender equity programmes, etc.

Besides, the students shall have social consciousness, regard for constitutional provisions, right perspective on environmental protection, awareness on gender equity, health and hygiene, Yoga and wellness, college social responsibility, culture and values, etc., to mention a few.

Further, the Ministry of India, GoI, through NIRF, prescribes quality research, infrastructure augmentation, enhanced placement and progression to higher education, equipment of employability skills leading to enhanced public perception about the college among the public.

Our institution has, from AY 2022-23, has devised its new vision and mission along with objectives and core values necessitating design and re-orientation of its academic administration in tune with them.

ORDER:

In the light of the above mandate and responsibilities prescribed by institutions vision and mission, SDG-4, NEP – 2020, NAAC, NIRF to the autonomous HEIs, need to customize, design and re-orient their academic and research administration in tune with the policies of above bodies, our institution is no exception.

Hence, the Chairmen of U.G and P.G Boards of Studies of various Departments are requested to make necessary arrangements for the conduct of the meetings on **31 August 2023**. They are further requested to prepare curricula and extracurricular activities and devise suitable evaluation system keeping in mind above recommendations to make students a wholesome personality and a 21st century student capable of facing challenges, adaptive to changes, creative and innovative.

Further, the Chairman of the each BOS, in association with the IQAC coordinator, preceding the BOS meeting, is requested to prescribe benchmarking, quality initiatives in pedagogy and learning; in design of curriculum (with 20% change) and optimum utilization of existing human, physical and ICT resources and adopt resolutions to the extent of benchmarks (As per SOP given in **Annexure – I)**. Further, as the regular attendance of students to the classes is a deciding factor in enhancement of quality in learning, a minimum attendance of 60% for I mid-term examination, 75% for II mid-term examination under CIA component shall be the benchmark for attendance and it shall be approved in the BOS. The Chairmen are also requested to approve the new programmes to be introduced for 2023-24, if any, number of certificate courses, their frequency, Bloom 's- Taxonomy based evaluation system for effective learning outcomes as per the Annexure – I.

The Chairmen are, therefore, requested to

• Design curricula of Odd and even semesters for the A.Y 2023-24 both for U.G and P.G courses in tune with the stated vision, mission of the institution, RAF of NAAC, NEP-2020 and NIRF.

• Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula and invite suggestions and changes to be made.

• Invite the University nominee, subject experts, industrial nominees, student nominees, parents well in advance along with the date, venue, agenda, etc. A soft copy shall be communicated well in advance to the members to have an idea on the matters.

• Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning experiences, resource utilization by staff ad students, etc.,

• Each Department shall approve and recommend additional credits for additional modules, training programmes, N.S.S, N.C.C, participation in cultural programs, sports and games, environmental programs, blood donations camps, etc.

• All meetings shall be offline. Online attendance of members faculty will be permitted only in exceptional cases.

• The Chairmen shall submit minutes of the meeting in the prescribed format only (Annexure – II) in triplicate (hard copies) to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the completion of BOS meeting and besides hosting the soft copy in the college website within the period stipulated.

• Each Chairman of BOS, shall get the rough draft of the curricula verified and approved by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity and commensurate with the stated vision and mission of the college among the departments.

• The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC coordinator will be the additional coordinator.

• The Academic Coordinator and IQAC coordinator conducted a meeting with the Chairmen, BOS on 28 August 2023 and explain the structure of curricula, uniformity other modalities.

• The Controller of Examinations of the institution shall fund the BOS meetings from the available funds on the condition of reimbursement after receiving autonomous funds from UGC. Initially, he shall pay Rs. 5,000/- uniformly as an advance to each Chairman towards each course (If BOS meetings for multiple courses are held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of courses x Rs.500/-)

• The Chairman of each BOS shall apply to the principal for advance amount for meeting the BOS meetings with head-wise expenditure in the prescribed format (Annexure-III).

Following contents shall be presented in the BOS document in order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the college
4. Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. Table showing the Allocation of Credits in the following table for both theory and Lab in case of science subjects

S. No	Semester	Title of the Course (Paper)	Hrs./week	Max. Marks (SEE)	Marks in CIA	Credits
1	III	Optics	4	50	50	4

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting (Activities and Bench marking as per Annexure –I)
7. At the end of each theory paper, each topic shall be mapped as per the Blooms taxonomy and scope of that topic for skill/ employability/ entrepreneurship opportunities in the following table incorporated

S. No	Subject	Semester	Title of the Course (Paper)	Topic	Parameter as per Blooms taxonomy (Knowledge / Application/ Creativity/ Innovation	Experiential learning component	Scope (Skill/ employability/ entreprenuership)
1	III	Botany	Plan Physiology	Plant Cell	Knowledge	Shall be shown Microscope	
2	III	History	Tourism	Tourism management	Application	Apprenticeship	Employability

8. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification, in the Proforma given in Annexure – I.

9. Attendance of Members present with signatures in the tabular form.

10. List of Examiners & Paper setters

11. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50 marks) for each course with structure.

12. Each student (2023-24 AB)has to complete one MOOCS course from SWAYAM in any subject per year which is mandatory.

CIA structure for Single Major system

➢ Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.

➢ I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.

➢ I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions to be given for each paper.

➢ Question paper is to be given as per the following structure for the courses with **4 units**

S.No	Unit No	Long Answer Question(10)	Short Answer Question(5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	2	1
4	IV	0	2	1+ one question from any with more syllabus weightage

➢ For I mid examination to be conducted in offline mode, Question paper is to be given as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question(5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment-5M	Seminar-5M	Clean & green and Attendance- 2M

CIA structure for 3 Major system

➢ Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.

➢ I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.

➢ I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions with one mark

➢The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment-5M	Seminar-5M	Clean & green and Attendance- 2M

CIA structure for 3 Major system for Honors programmes(2020-21AB)

➢ Out of 40 marks for CIA, 20 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.

➢ I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.

➢ I mid examination to be conducted in offline mode in which the student should attempt **Two essay** questions for ten marks each out of three questions, **four short** answer questions with five marks each out of six questions.

➢The remaining 20 marks for CIA are allocated as per the following structure

Assignment-10M	Seminar- 5M	Quiz -5M

PRINCIPAL

PRINCIPAL
P.R.Govt. College (A)
KAKINADA

Pithapur Rajah's
Government Autonomous College
Kakinada

OFFICE OF THE DEAN, ACADEMIC AFFAIRS

ADIKAVI NANNAYA UNIVERSITY

RAJAMAHENDRAVARAM

No. ANUR/DAA/PR Govt. College (A)/Sub. Experts/2021 Date: 22-10-2021

PROCEEDINGS OF THE VICE-CHANCELLOR

Sub:- ANUR- DAA – Nominated University Subject Experts for BOS – PR Govt. College (A), Kakinada – Orders - Issued.

Ref:- 1. Lr. dated 15.09.2021, from the Principal, PR Govt. College (A), Kakinada
2.Proc. No: ANUR/PRG College (A), KKD/UG BoS/2019/09, dated 19.03.2019

Read:-Note for Orders of the Vice-Chancellor dated 21.10.2021

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ORDERS

Having consider the request cited in the ref. 1, the Vice-Chancellor is pleased to order that the following members be nominated as University Subject Experts for UG Board of Studies of ***PR Govt. College (A), Kakinada*** for a period of three years from the date of the proceedings issued.

S.No.	UG Courses	Name of the Subject Expert
1	English	Dr. Prasanthi Sree, AKNU MNS Campus, Kkd, Ph No: 9848297555, sathupathi.sri@gmail.com
2	Hindi	Dr. N Venkata Ramana, SKBR College, Amalapuram, Ph. No: 9849373773
3	Telugu	Dr. P. Nagaraju, GDC, Palakollu, Ph.No: 9052038569, raju00517@gmail.com
4	Sanskrit	Dr. TGY Acharyulu, SKR Womens College, Rajahmundry, Ph. No: 9848628812
5	Mathematics	Dr. V. Anantha Lakshmi, Principal, GDC Pithapuram, Ph. No : 9963786386, ananthamaths@rediffmail.com
6	Statistics & Actuarial Sciences	Dr. D V Ramana Murthy, HoD of Statistics, SKVT College, Rajamahendravaram, Ph.No: 9949135864, drdvrmurthy@gmail.com
7	Chemistry & Analytical Chemistry	Dr. K. Jhansi Lakshmi, Principal, Ideal College of Arts & Sciences, KKD, Ph.No: 9441236409, jhansikalisindi@gmail.com
8	Physics & Electronics	Dr. Paul Diwakar, Sri CRR College (A), Eluru, 9985050696
9	Petro Chemicals	Dr. M Trinadh, Lecturer in Chemistry, Govt. College (A), Rajahmundry, Ph. No: 8639551783
10	Bio-Chemistry	Dr. M Suvarchala, Lecturer in home science, ASD women's Degree College, KKD, Ph. No: 9346512694, suvarchakamallela@gmail.com
11	Food Science	
12	Botany	Dr. J. Sujatha, Leturer in Botany, GDC Rjy, Ph.No: 9441050910, drjsuneetha@gcrjy.ac.in
13	Microbiology	Dr. D Aruna, Lecturer in Micro-biology, ASD Women's College, Kakinada, Ph. No: 9182525872
14	Zoology	Dr. B. Tejo Murthy, Lecturer in Zoology, GDC Yeleswaram, Ph. No: 9703799970, drmtm2011@gmail.com
15	Bio Technology	Dr. B. Nageswari, Lecturer in Biotechnology, GDC Rjy, Ph. No: 986621955

16	Commercial Aquaculture	Dr. P Ramamohana Rao, Aquaculture Consultant, KKD, Ph. No: 9885144557, asreenivasulu@gmail.com
17	Computer Science & Computer Applications	Mr. N. Naga Subrahmanyesweri, Lecturer in Computer Science, ASD Women's College, KKD, Ph. No: 9948438376, yesweri.velugu@asddgcw.ac.in
18	Commerce	Dr. K. Ratna Manikyam, Govt. College (A), RJY, Ph. No: 8919230362, drkrm@gcrjy.ac.in
19	Economics	Dr. D. V. Nageshwara Rao, Lecturer, GDC, RJY, Ph. No: 9490919676
20	History	Dr. B. Anjani Kumari, Lecturer in charge, GDC (W), Ph. No: 891989337
21	Philosophy	Dr. V. Venkatarao, Lecturer in Philosophy, MR College, Vijayanagaram, Ph. No: 9440096609
22	Political Science	Dr. Seetha Mahalaxmi, Lecturer in Political Science, GDC, RJY Ph. No: 9491011844
23	Journalism & Mass Communication	Prof. DVR Murthy, Dept. of Journalism & Mass Communication, Andhra University, Vishakapatnam, Ph. No: 9985051793, 9440974092
24	Horticulture	Dr. J. Sujatha, Lecturer in Botany, GDC, Rjy, Ph. No: 9441050910, drjsuneetha@gcrjy.ac.in
25	Pharmaceutical Chemistry	Dr. K. Deepthi, Asst. Professor, Dept. of Chemistry, AKNU, Rjy, Ph. No: 9985469607, deepthikorabandi@gmail.com

(BY ORDERS)

Dean 22/10/21
ACADEMIC AFFAIRS

To
The Principal, PR Govt. College (A), Kkd
PA to R
PS to VC,
OOF

PROCEEDINGSOFTHEPRINCIPAL,P.R.GOVERNMENTCOLLEGE(A),

Kakinada Present: Dr. B. V. Tirupanyam, M.Sc; Ph.D.

R.C.No.1/A.C./BOS/2023-24, Dated: 29.08.2023

SUB: P.R. Government College(A), Kakinada-UG Board of Studies (BOS)- Program/Course-Nomination of Members-Orders issued.

REF: 1. UGC Guidelines of for Autonomous Colleges-2018.

ORDERS: The Principal, P.R. Government College(A), Kakinada is pleased to constitute UG Boards of Studies in Statistics/Actuarial science for framing the syllabi in respective Subject for all Semesters duly following the norms of the UGC Autonomous guidelines.

S.No	Name of the Person	Designation
1	Smt. P.Jyothi	Chairman& Lecturer Incharge, Department.
2	Dr. D.V. RamanaMurthy Head, Dept.of statistics, SKVT college, Rajahmundry.	University Nominee
3	Dr. N. Madhavi HOD of statistics, Govt. COLLEGE(A), Rajamahendravaram	Subject Expert -I Lecturer in Statistics
4	Smt .P.Raja Rajaeswari lecturer in Statistics Aditya Degree College for Women ,Kakinada	Subject Expert - II Lecturer in Statistics
5	Sri Ch. Tata Rao ,A.O	LIC, Kakinada
6	B. kalyan Kumar	Member
7	Md.Sammer	Student Alumni Member
8	B.Sai Yashwanth	Student Member
9	Ch.lalitha Gayatri	Student Member
10	P.Sharon jyoshna	Student Member
11	N.venkatesh	Student Member

The above members are requested to attend the BoS meeting on 31-Aug-2023(online)and share their valuable reviews, and suggestions on the following functionaries.

Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stake holders and National requirement for consideration and approval of the IQAC and Academic Council.

Suggested methodologies for innovative teaching and evaluation techniques.

Suggest the panel of Names to the academic council for appointment of Examiners.

Coordinate research, teaching, extension and other activities in the Department of the college.

PRINCIPAL

P. R. Government College(A), Kakinada

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

Department of Statistics

The Board of Studies meeting for **Statistics** subject during the academic year 2023-2024 is conducted at the Dept. of Statistics on 31.08.2023 (online) at 11:00 AM with Smt P.JYOTHI. , Lecturer In-charge in Statistics the chair along with the following members.

Name with Designation and Address		**Signature**
Smt. P.Jyothi Lecturer in IN CHARGE P. R. Govt College(A),KAKINADA	Chair Person	P. Jyothi 31/8/23.
Dr. D. V. RAMANA Murthy Head, Dept.of statistics,SKVT college,Rajahmundry	University Nominee	31.08.23
i)Dr. N. Madhavi HOD of statistics, Govt. COLLEGE(A), Rajamahendravaram ii)Sri. Smt .P.Raja Rajaeswari lecturer in Statistics, Aditya Degree College for Women, Kakinada	Subject expert	N. Madhavi 31/8/2023 P. Raja Rajeswari 31/8/23
Sri Ch. Tata Rao, A. O LIC,Kakinada.	Industrialist	31/8/2023
Members from the College		
B.Kalyan kumar	Faculty of the Department	B. Kalyan
Student Members		
Md.Sammer	Student Alumni Member	Md. Sammer
B.Yaswath I MSCS	Student Nominee	B. Yaswath
P.lalitha gayatri I MSCS	Student Nominee	P. lalitha gayatri
N.Venkatesh II MSCS	Student Nominee	N. Venkatesh
P.Sharon joshna II MSCS	Student Nominee	P. S. Joshna

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

DEPARTMENT OF STATISTICS

Meeting of the Board of studies is held at 11:00 AM (online) on 31-08-2023 in the Department of Statistics ,**PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA** with the following agenda.

Agenda

1. a)To approve the curriculum, blue print and model paper for 1st year B.Sc Statistics (hon's) under CBCS based as per the directions of the APSCHE for the admitted batch 2023 -24(I & II Semesters).

b)To approve the curriculum, blue print and model paper of practical examinations for 1st year B.Sc Statistics (hon's) under CBCS based as per the directions of the AKNU for the admitted batch 2023 -24.(I & II Semesters).

2. To approve the curriculum, blue print and model paper for 2nd year B.Sc Course under

CBCS based as per the directions of the APSCHE for the admitted batch 2022-23(III & IV Semesters)

3. To approve the curriculum, blue print and model paper for 3rd year B.Sc Course under

CBCS based as per the directions of the APSCHE for the admitted batch 2021 -22(V & VI Semesters)

4. To approve the Two Certificate Courses (SPSS , Descriptive statistics using R) one for statistics students were introduced in this academic year

5. To approve to introduce Additional inputs to various courses (where ever necessary)

6. To approve the Examination procedure for the courses for I, II, III years of B.Sc

(2023 – 24, 2022-23& 2021-22 admitted batches).

a) Each theory subject is evaluated for 100 Marks (I, II&III Years) out of which 50

Marks through semester end examination for I,II&III year, and internal assessment would be for 50 Marks for I ,II &III year

b) The minimum pass mark for both internal and external examinations is 18 marks (36%),

but as a whole student is subjected to get 40% marks (40 out of total 100 marks) to pass

the subject. (I, II&III Years)

CIA structure for Single Major system

➢ Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.

➢ I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.

➢ I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions to be given for each paper.

➢ Question paper is to be given as per the following structure for the courses with **4 units**

S.No	Unit No	Long Answer Question(10)	Short Answer Question(5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	2	1
4	IV	0	2	1+ one question from any with more syllabus weightage

➢ For I mid examination to be conducted in offline mode, Question paper is to be given as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question(5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory-3M	Assignment-5M	Seminar- 5M	Clean & green and Attendance- 2M

CIA structure for 3 Major system

➢ Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.

➢ I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.

➢ I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions with one mark

➢The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory-3M	Assignment-5M	Seminar- 5M	Clean & green and Attendance- 2M

First Mid Examination is conducted in offline mode (centralised) and Second Mid examination is conducted is same as first mid examination process through online mode (At Department level).

d) Internal assessment for 50 Marks is as follows: (For Certificate Courses)

vii) Study Project : 20 Marks

viii) Student Seminar : 10 Marks

ix) Viva-voce : 10 Marks

x) Assignment : 10 Marks

7. Scheme of Valuation for Practical's

- Record - 10 Marks
- Viva voce - 4 Marks
- Test - 36 Marks
- Total - 50 marks

Answer any 3 questions out of Five questions. Each question carries 12 marks.

8. To award two extra credit to students who have registered and completed SWAYAM course successfully.

9. To award 4 credits for each first and second phases of Apprenticeship between 1st and 2nd year and 2nd and 3rd year (two summer vacations).

10. To implement pedagogical strategies to enrich teaching and learning process.

11. To approve the proposed departmental activities for 2023-24.

12. To approve the list of examiners and paper setters for the academic year 2023-24.

13. Any other item with the permission of the chair.

CHAIRMAN
BOARD OF STUDIES

Resolutions taken :

The following resolutions are approved by university nominee and all the members of BOS

After reviewing the existing titles and contents of class I,II,III,IV and V framed by APSHE, the board come out with the following resolutions.

Resolution – I

It is resolved to approve the following changes of course I,II,III,IV and V of Statistics as it is given by APSCHE.

As a part of this, from the academic year, as NEP-2020, the major and minor policy system has come into effect.

According to this, in the first semester of the first year Course-I & Course-II papers were given as common to each major .Mathematics, Physics, Chemistry and Computer departments have to thought these papers.

FIRST YEAR : SECOND SEM –MAJOR&MINOR

COURSE 3&COURSE 4: It is resolved to approved the curriculum, blue print and model paper for 1st year B.Sc Statistics (hon's) under CBCS based as per the directions of the APSCHE for the admitted batch 2023 -24. (II Semester)

SEMESTER II COURSE-III&COURSE-IV model can be changed

SECTION I

Part –A : Given 3 questions

Part –B : Given 3 questions

Write any 3 questions ,at least1 question from each part. each question carries 10 marks

SECTION II

Write any four questions out of seven questions. Each question carries 05 marks

SECONDYEAR :COURSE-III

1. Difference between t & f distribution topic is deleted in unit I
2. Addition of method of least square topic in unit II

Paper-III model can be changed

SECTION I

Part –A : Given 3 questions

Part –B : Given 3 questions

Write any 3 questions ,at least1 question from each part. each question carries 10 marks

SECTION II

Write any four questions out of seven questions. Each question carries 05 marks.

SECONDYEAR :COURSE-IV

1. Determination of sample size topic is deleted in Unit-I

2. Cochran's theorem, fixed effect& random effect model topics are added in Unit-III

Paper-IV model can be changed

SECTION I

Part –A : Given 3 questions

Part –B : Given 3 questions

Write any 3 questions ,at least1 question from each part. each question carries 10 marks

SECTION II

Write any four questions out of seven questions. Each question carries 05 marks

SECONDYEAR :COURSE-V

1. Deseasonalization topic are deleted in Unit-II
2. Detrending-effect of elimination of trend on other components of the time series topics are deleted in unit III.
3. Abridge life tables topic is added in unit-V

Paper-V model can be changed

SECTION I

Part –A : Given 3 questions

Part –B : Given 3 questions

Write any 3 questions ,at least1 question from each part. each question carries 10 marks

SECTION II

Write any four questions out of seven questions. Each question carries 05 marks

THIRDYEAR :COURSE-VI(A)

1. Advantages and limitations of models topic are deleted in Unit-I
2. Economical duality topic are deleted in unit IV.

Paper-VI(A) model can be changed

SECTION I

Part –A : Given 3 questions

Part –B : Given 3 questions

Write any 3 questions ,at least1 question from each part. each question carries 10 marks

SECTION II

Write any four questions out of seven questions. Each question carries 05 marks

THIRDYEAR :COURSE-VII(A)

1. Traveling sales man problem topic are deleted in Unit-II
2. Time cost optimization algorithm topic are added in unit IV.

Paper-VII(A) model can be changed

SECTION I

Part –A : Given 3 questions

Part –B : Given 3 questions

Write any 3 questions ,at least1 question from each part. each question carries 10 marks

SECTION II

Write any four questions out of seven questions. Each question carries 05 marks

Resolution – II

1. It is resolved to approved the incorporation of additional inputs to various courses (where ever it is felt necessary) for enhancing students understanding over the Concerned course and this shall not be considered for evaluation purpose.

2. Resolved to adopt Community Service Project for all the students at the end of Sem –II.

3. Resolved to send all the final year Statistics students for on job training apprenticeship In connection with the industries for off-site Project in the end of Sem V/VI with the industries in accordance with their interest of study.

4. It is resolved to approve the proposed departmental activities for 2023-24.

5. It is resolved to approve the list of examiners and paper setters for the academic year 2023-24.

6.**Streamlining of regularity in attendance. Resolved to make the eligibility to appear for 1st mid is 75% of attendance for the2nd mid it would be 75% , for 75% of attendance for semester examination and 90% for practical examinations .Also it is resolved that the student should attend at least one internal exam to appear for the Semester end examination.**

7.Resolved to give extra credits for MOOCS courses, N.S.S., N.C.C., winners of zonal level sports and games competitions, participation in state level/ National level competitions, blood donations camps ,environmental programs like extending services in facing the natural calamities etc.

8.Resolved to Engaging of 7th hour of time table.

9. Resolved to conduct International / National , Webinar / Seminar like Data Science, etc.,

10. Resolved to introduce new courses of study whenever necessary.

11. Resolved to follow the admission criteria for the programmers offered by the department.

12. Resolved to conduct extension lectures by the eminent persons.

13. It is resolved to conduct a workshop on SPSS ,by a eminent persons.

14.It is resolved to arrange a field trip.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA
DEPARTMENT OF STATISTICS

Objectives of Department of Statistics:

- To inspire knowledge across different areas in Statistics and Actuarial Science.
- To impart knowledge on Statistical concepts like Data Collection, Measures of Central Tendency and Dispersion, Probability and Distributions, Statistical Methods, Inference, Sampling methods, Experimental Designs, Economical and Vital Statistics, SQC, reliability and Operations Research.
- To impart knowledge on Actuarial Science concepts like basics of Economics, Financial Accounting and Mathematics, Surviving models, life contingences, Business communication, Actuarial Statistics , Mortality and Insurance,
- To equip our students with good quality to appear for competitive examinations.
- To make the students to understand the needs of Statistics and Actuarial Science in Science, Technology and various industries like manufacturing, construction, insurance, IT, Pharmacy, etc.
- To inculcate research atmosphere among students by assigning projects.
- To provide learning environment by organizing industrial/field visits.
- To conduct remedial classes to slow learners and assign research work to advance learners in collaboration with industries.
- To organize guest lectures by inviting the resource persons from in and outside of universities for improving quality in education
- To celebrate significant days like, National/World Statistics Day, Mathematics Day, Science Day, etc
- To upgrade the students with latest Technology and Statistical softwares.
- To make the students to join in Post Gradation in the domain of Statistics/Actuarial Science/related subjects in top universities after completion of their UG course
- To make the students to get placements in Govt. and Private sectors in various positions viz, Assistant Statistical Officer, AD, Statistician, Data Analyst, Data Scientist, Business Analyst, Actuarial Analyst, Actuary, Risk Analyst, Bank PO, etc.

  - The Department of Statistics is offering two **B.Sc**. courses **MSCs** and **MSAs**,

PROGRAMME OUTCOMES

For every degree program expectations are listed out by the institution under the Program Outcomes.

PO1. Knowledge and Understanding of:

1. All concepts at under graduate level.
2. Real life applications of these concepts and relationship between them.

PO2. Intellectual skills – be able to:

1. Think logically and arrange real life situations to mathematical form.
2. Assimilate knowledge and ideas based on wide reading and through the internet.
3. Transfer of appropriate knowledge and methods from one topic to another within the subject.
4. Understand the evolving state of knowledge in a rapidly developing field.

PO3. Transferable skills:

1. Use of IT (word-processing, use of internet for doing project).
2. Ability to work as part of a team.
3. Ability to use library resources/Equipment.
4. Time management.

PO4. Problem analysis:

1. Conversion of real life problem to Mathematical model and analyze with suitable Statistical tools.
2. Conduct investigations of complex problems: Use research-based knowledge.

PO5. Ethics:

1. Apply ethical principles,commit environment and responsibilities among students.

PO6. Individual and team work:

1. Function effectively as an individual and as a member in diverse teams, and in multidisciplinary settings.

PO7. Communication:

1. Communicate effectively on complex group activities and with society at large. Speak, read, write and listen clearly in person and through electronic media .

PO8.Critical Thinking:

1. Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO9. Effective Citizenship:

1. Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO10. Life-long learning:

1. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

S.No.	Programme	PSO
1	B.Sc. (Mathematics, Statistics, Computer Science) (Code: BS 11)	PSO1: To understand nature, scope, basic concepts and terminology of the three courses of the programme.
		PSO2: To identify and understand the applications of the three courses in different areas like, physical sciences, life sciences, arts and humanities, Business, various industries, etc
		PSO3: To solve various real life problems by developing mathematical model and applying various statistical tools with the help of computer programming knowledge.
		PSO4: To develop research thinking to solve critical problems.
2	B.Sc. (Mathematics, Statistics, Actuarial Science) (Code: BS 14)	PSO1: To understand nature, scope, basic concepts and terminology of the three courses of the programme.
		PSO2: To identify and understand the applications of the three courses in different areas like, physical sciences, life sciences, arts and humanities, Business, Insurance, various industries, etc
		PSO3: To solve various real life problems by developing mathematical model and applying various statistical tools with the help of suitable economic, finance and risk policies.
		PSO4: To develop research thinking to solve critical problems.

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

Yr.	Sem&Course (Th / Lab)	Course Title	Workload Hrs./week	Credits	Max. Marks		
					Intrnl.	Extrnl	Tot.
I	**II sem Course-III Theory**	Descriptive Statistics	4Hrs	4	50	50	100
	II sem Course-III Lab	Descriptive Statistics PracticalCourse	2 Hrs	1	_	_	50
	II sem Course-IV Theory	Random Variables & Mathematical Expectations	4Hrs	4	50	50	100
	II sem Course-IV Lab	RandomVariables& MathematicalExpectations PracticalCourse	2 Hrs	1	_	_	50
II	III Sem Course-III **Theory**	Statistical Inference	4 Hrs	4	50	50	100
	III Sem Course-III Lab	Practical-III	2 Hrs	1	_	_	50
	IV Sem Course IV Theory	Sampling Techniques & Design of Experiments	4 Hrs	4	50	50	100
	IV Sem Course IV Lab	Practical-IV	2 Hrs	1	_	_	50
	IV Sem Course V Theory	Applied Statistics	4 Hrs	4	50	50	100
	IV Sem Course V Lab	Practical-V	2 Hrs	1	_	_	50
III	**V Sem Course 6A Theory**	Operation Research –I	4 Hrs	3	50	50	100
	V Sem Course 6A Lab.	Practical-6A	2 Hrs	2	_	_	50
	V sem Course 7A Theory	Operation Research –II	4 Hrs	3	50	50	100
	V sem Course 7A Lab	Practical-7A	2 Hrs	2	_	_	50
Open to all	**Certificate Course 01**	SPSS	40 Hrs				50

Open to all	**Certificate Course 02**	Descriptive Statistics with R	40 Hrs				50

OBJECTIVE OF THE COURSE

Statistics is a key to success in the field of science and technology. Today, the students need a thorough knowledge of fundamental basic principles, methods, results and a clear perception of the power of statistical ideas and tools to use them effectively in modeling, interpreting and solving the real life problems. Statistics plays an important role in the context of globalization of Indian economy, modern technology, computer science and information technology.

The main objectives of the course are

- To build the basis for promoting theoretical and application aspects of statistics.
- To underline the statistics as a science of decision making in the real life problems with the description of uncertainty.
- To emphasize the relevance of statistical tools and techniques of analysis in the study of inter-disciplinary sciences.
- To acquaint students with various statistical methods and their applications in different fields.
- To cultivate statistical thinking among students.
- To develop skills in handling complex problems in data analysis and research design.
- To prepare students for future courses having quantitative components.

This course is aimed at preparing the students to hope with the latest developments and compete with students from other universities and put them on the right track

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester I B.Sc Major/Minor (II Sem) (2023-24)			
Course Code	TITLE OF THE COURSE **Descriptive Statistics**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:	**Basic Knowledge in Probability, Distributions and methods in statistics**	4	-	-	4

Course Objectives:

- This course gives the students to review good practice in presentation and format that most applicable to their own data.
- The measures of central tendency or averages reduce the data to a single value which is highly useful for making comparative studies.
- The measures of dispersion throw light on reliability of average and control of variability
- This paper deals with the situation where there is uncertainty and how to measure that uncertainty by defining the probability, random variable which are essential in all research areas.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	**learn about basic concepts of Statistics**
CO2	**learn about basic concepts of pictorial data**
CO3	**learn about various measures of Central tendency**
CO4	**know about various measures of dispersion**
CO5	**know about Probability Concept and Random variables**

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Unit–1:Statistical Description of Data

Origin, history and definitions of Statistics. Importance, Scope and limitations Statistics. Function of Statistics – Collection, Presentation, Analysis and Interpretation. Collection of data - primary and secondary data and its methods. Classification of data – Quantitative, Qualitative, Temporal, Spatial. Presentation of data – Textual, Tabular – essential parts.

Unit– 2:
Measurement Scales– Nominal, Ordinal, Ratio and Interval. Frequency distribution and types of frequency distributions, forming a frequency distribution .Diagrammatic representation of data– Historiagram ,Bar, Multiple bar and Pie with simple problems .Graphical representation of data: Histogram ,frequency polygon and Ogives with simple problems.

Unit–3:Measures of Central Tendency(MCT)

Arithmetic Mean – properties, methods .Median, Mode, Geometric Mean (GM), Harmonic Mean (HM).Calculation of mean, median, mode, GM and HM for grouped and ungrouped data .Median and Mode through graph. Empirical relation between mean , median and mode. Features of good average.

Unit–4:Measures of Dispersion

Concept and problems – Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non – Central moments and their interrelationship. Sheppard's correction for moments .Skewness and its methods ,kurtosis.

Unit–5:Elementary Probability

Basic Concepts of Probability, random experiments, trial , outcome, sample space, event , mutually exclusive and exhaustive events ,equally likely and favorable outcomes .Mathematical, Statistical ,axiomatic definitions of probability .Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 and for n events and simple problems .Boole's inequality ,Baye's theorem and its applications in real life problems.

Textbooks:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan.
2. BA/BSc I year Statistics-descriptive statistics, probability distribution-Telugu Academy-Dr M. JaganmohanRao, Dr.N.SrinivasaRao, Dr P.TirupathiRao, Smt. D.Vijayalakshmi.
3. B.A/B.Sc Statistics Descriptive Statistics and Probability, Kalyani Publishers by D.V.L.N. Jogiraju, C. Srikala and L.P. Raj Kumar

Reference books:

1. S.C. Gupta&V.K. Kapoor:FundamentalsofMathematicalStatistics,Sultan Chand & Sons,NewDelhi.
2. O.P.Gupta: MathematicalStatistics,KedarnathRamnath&Co.
3. P.N.Arora&S.Arora:QuantitativeAptitudeStatistics–VolII,S.Chand&CompanyLtd.
4. K.Rohatgi&EhsanesSaleh: AnIntroductionto Probabilityand Statistics, JohnWiley&Sons.

WebLinks:

1. https://conjointly.com/kb/descriptive-statistics/
2. https://en.wikipedia.org/wiki/Descriptive_statistics
3. https://www.scribbr.com/statistics/descriptive-statistics/

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester I B.Sc Major/Minor (II Sem) (2023-24)			
CourseCode	TITLE OF THE COURSE Descriptive Statistics Practical Course				
Practical	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in Sampling concept	-	-	2	1

1. Writing a Questionnaire in different situations.
2. Forming a grouped and ungrouped frequency distribution table.
3. Diagrammatic presentation of data–Bar ,multiple Bar and Pie.
4. Graphical presentation of data–Histogram, frequency polygon ,Ogives.
5. Computation of measures of central tendency–Mean ,Median and Mode.
6. Computation of measures of dispersion–Q.D .,M.D and S.D.
7. Computation of non-central, centralmoments,$_1$and$\beta_2$forungroupeddata.
8. Computation of non- central, central moments , β_1 and β_2 and Sheppard's corrections for grouped data.
9. Computation of Karl Pearson's and Bowley's Coefficients of Skewness.

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

Virtual Lab Links:

1. https://conjointly.com/kb/descriptive-statistics/
2. https://en.wikipedia.org/wiki/Descriptive_statistics
3. https://www.scribbr.com/statistics/descriptive-statistics/
4. https://byjus.com/maths/probability-and-statistics/
5. https://oli.cmu.edu/courses/probability-statistics-open-free/

SEMESTER-II: DESCRIPTIVE STATISTICS

Model blue print for the Question Paper setter

Max. Marks: 50 **Time: 2 Hrs.**

Module	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	1	1	15
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	7	6	95

Pithapur Rajah's Government College (Autonomous), Kakinada
I year B.Sc.statistics (hons), Degree Examinations - II Semester (w.e.f 2023-24)
For 2023-24 batch
Statistics Course (Major/Minor)–II:Descriptive Statistics
Model Paper

Time: 2 Hrs. **Max. Marks: 50**

Answerany THREE of thefollowing. Choosing at least one from each part.3x10=30

SECTION - A

PART- I

1. **What do you understand by collection of data? Discuss different methods**

2. **Draw a Histogram ,Frequency polygon and Ogive curve to the given data**

Class Intervals	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**
Students	**12**	**24**	**15**	**7**	**11**

3. **Explain the methods of measuring skewness and kurtosis of a frequency distribution.**

PART- II

4. **Describe the different measures of Dispersion and discuss their merits and demerits.**

5. **State and prove** Bayes theorem
6. **State and prove additional theorem for 2 events?**

SECTION – B

Answer any FOUR of the following: 4x5=20M

7. **What is Statistics and its applications?**
8. **Explain types of classification?**
9. **Explain about measurement of scales?**
10. **Define Moment? Explain types of moments?**
11. **Find Mean, Median and Mode to the following data 6,6,7,8,8,8,2,5,6,9, and 5**
12. **Define Range .**
13. **State and prove additional theorem for 2 events?**

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester I B.Sc Major (II Sem) (2023-24)			
Course Code	**TITLE OF THE COURSE RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:	**Basic Knowledge in random varibles ,expectations and about generating functions**	4	-	-	4

Course Objectives:

- This course gives the students to review good practice in presentation and format that most applicable to their own data.
- The measures of central tendency or averages reduce the data to a single value which is highly useful for making comparative studies.
- The measures of dispersion throw light on reliability of average and control of variability
- This paper deals with the situation where there is uncertainty and how to measure that uncertainty by defining the probability, random variable which are essential in all research areas.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	**learn about basic concepts of Statistics**
CO2	**learn about basic concepts of pictorial data**
CO3	**learn about various measures of Central tendency**
CO4	**know about various measures of dispersion**
CO5	**know about Probability Concept and Random variables**

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Unit– 1:UnivariateRandomVariables

Definition of random variable (r.v.), discrete and continuous random variables, functions of random variable. Probability mass function, Probability density function, Distribution function and its properties .Calculation of moments, coefficient of skewness and kurtosis for a given pmf and pdf.

Unit – 2:BivariateRandomVariables
Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.

Unit–3:Mathematical Expectation

Mathematical expectation of function a random variable. Moments and covariance using mathematical expectation with examples.

Addition and Multiplication theorems on expectation Properties of expectations ,variance ,covariance. Chebyshev and Cauchy-Schwartz inequalities and their applications

Unit–4:Generating functions

Definitions of Moment Generating Function, Cumulant Generating Function, Characteristic Function and Probability Generating Function and their properties. Weak Law of Large Numbers (WLLN),Strong Law of Large Numbers (SLLN).

Unit–5:LimitTheorems

Concept – Population, Sample, Parameter, statistic, Sampling distribution, Standard error. Convergence in probability and convergence in distribution, concept of Central limit theorem. Lindberg – Levy CLT and its applications ,Statement of Lyapunov's CLT,relationship between CLT and WLLN

Textbooks:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan.
2. BA/BSc I year Statistics-descriptive statistics, probability distribution-Telugu Academy-Dr M. JaganmohanRao, Dr.N.SrinivasaRao, Dr P.TirupathiRao, Smt. D.Vijayalakshmi.
3. B.A/B.Sc Statistics Descriptive Statistics and Probability, Kalyani Publishers by D.V.L.N. Jogiraju, C. Srikala and L.P. Raj Kumar

Reference books:

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4. K.Rohatgi&EhsanesSaleh: AnIntroductionto Probabilityand Statistics, JohnWiley&Sons.

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CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester I B.Sc Major (II Sem) (2023-24)			
CourseCode	TITLE OF THE COURSE RANDOMVARIABLESANDMATHEMATICALEXPECTATIONS				
Practical	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic Knowledge in random varibles ,expectations and about generating functions	-	-	2	1

1. Calculation of moments of uni variate random variable tothe given pmf.
2. Calculation of coefficient of skewness and kurtosis of uni variate random variable to the given pmf.
3. Calculation of moments of uni variate random variable to the given pdf.
4. Calculation of coefficient of skewness and kurtosis of uni variate random variable to the given pdf.
5. Problem related to jpmf, mpmf and conditional pmf and its independence.
6. Problem related to jpdf, mpdf andconditional pdf and its independence.
7. Chebyshev‘s inequality application oriented problems.

Virtual Lab Links:

1. https://conjointly.com/kb/descriptive-statistics/
2. https://en.wikipedia.org/wiki/Descriptive_statistics
3. https://www.scribbr.com/statistics/descriptive-statistics/
4. https://byjus.com/maths/probability-and-statistics/
5. https://oli.cmu.edu/courses/probability-statistics-open-free/

SEMESTER-II:RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS

Model blue print for the Question Paper setter

Max. Marks: 50 **Time: 2 Hrs.**

Module	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	1	1	15
II	1	1	15
III	2	2	30
IV	1	1	15
V	2	1	20
Total including choice	7	6	95

Pithapur Rajah's Government College (Autonomous), Kakinada
I year B.Sc.statistics (hons), Degree Examinations - II Semester (w.e.f 2023-24)
For 2023-24 batch
Statistics Course (Major)–II:RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS
Model Paper

Time: 2 Hrs. **Max. Marks: 50**

Answer any THREE of the following. Choosing at least one from each part. **3x10=30M**

SECTION - A

PART- I

1. **Define Distribution function and explain it's properties.**
2. **Define joint, marginal and conditional Distributions.**
3. **State and prove Cauchy-Schwartz inequality.**

PART- II

4. **State and prove Multiplication theorems on expectation.**
5. **Define about Probability Generating Function and explain their properties**
6. **Explain about Convergence in probability and convergence in distribution.**

SECTION – B

Answer any FOUR of the following: **4x5=20M**

7. **Define Discrete and continuous random variables**
8. **Explain about Bi-variate random variable**
9. **Explain about Properties of expectations**
10. **Define Variance and Explain about properties of variance on expectation**
11. **Define Moment Generating Function**
12. **Explain about concept of Central limit theorem.**
13. **Define (i) Parameter (ii) Statistic (iii) sample**

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester II B.Sc. (III Sem)			
Course Code 3211	TITLE OF THE COURSE **Statistical inference**				
Practical	**Hours Allocated: 30 hrs**	**L**	**T**	**P**	**C**
Pre-requisites:	**Basic knowledge in Sampling concept**	**4**	**-**	**-**	**4**

Objectives:

- To provide basic knowledge on sampling distributions and applications of chi-square, t, and F
- To enhance the knowledge to find the estimators of parameters keeping in view the properties of estimators
- To give an central idea to apply parametric and non-parametric methods to test hypotheses

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	**Students would be able to learn about estimation concept**
CO2	**Students would be able to learn about Hypothesis and its procedure**
CO3	**Students would be to learn large sample tests and small sample tests**
CO4	**Students would be able to learn about Non parametric tests**
CO5	**Students would be to learn computation part**

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

UNIT-*I (10 Hrs)*

Concepts: Population, Sample, Parameter, statistic, Sampling distribution, Standard error. convergence in probability and convergence in distribution, law of large numbers, central limit theorem (statements only). Student's t- distribution, F – Distribution, χ^2-Distribution: Definitions, properties and their applications, Additional Inputs :Difference between t and F Distributions.

UNIT-*II (10 Hrs)*

Theory of estimation:Estimation of a parameter, criteria of a good estimator – unbiasedness, consistency, efficiency, &sufficiency and. Statement of Neyman's factorization theorem.Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE's . Method of least square Estimation of Binomial, Poisson &Normal Population parameters by MLE method. Confidence Intervals for mean and variance in Normal Distribution .

Additional Inputs: confidence limits, Method of estimation

UNIT-*III (8 Hrs)*

Testing of Hypothesis: Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests.Neyman-Pearson's lemma. Ump test, uniform most powerful test. Examples in case of Binomial, Poisson, Exponential and Normal distributions.

Additional Inputs: likelihood Ratio test

UNIT – *IV (12 Hrs)*

Large sample Tests:Large sample test for single mean and difference of two means, confidence intervals for mean(s). Large sample test for single proportion, difference of proportions.standard deviation(s) and correlation coefficient(s).

SmallSampletests:t-testforsinglemean,differenceofmeansandpairedt-test,testforcorrelation.χ2-test for goodness of fit and independence of attributes. F-test for equality of variances, Exact sampling distribution.

UNIT – *V (10 Hrs)*

Non-parametric tests- advantages and disadvantages, comparison with parametric tests.Measurement scale-nominal, ordinal, interval and ratio.One sample runs test, sign test and Wilcoxon-signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon –Mann-Whitney U test.

Additional Inputs: Sequentional analysis introduction.

Textbooks:

1. **B.A/B.Sc II Year statistics-statistical methods and inference-Telugu Academy by A.Mohanrao,N.SrinivasaRao, Dr.R.SudhakaraReddy,Dr.T.C. Ravichandrakumar**
2. **K.V.S.Sarma Statistics Made simple: Do it yourself on PC, PHI.**
3. **B.A/B.Sc Statistics Descriptive Statistics and Probability, Kalyani Publishers by D.V.L.N. Jogiraju, C. Srikala and L.P. Raj Kumar.**

Reference books:

1. **V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi**
2. **Goon AM, Gupta MK,Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt.Ltd, Kolkata.**
3. **Hoel P.G: Introduction to matehematical statistics, Asia Publishing house.**

WebLinks:

1. **https://conjointly.com/kb/descriptive-statistics/**
2. **https://en.wikipedia.org/wiki/Descriptive_statistics**
3. **https://www.scribbr.com/statistics/descriptive-statistics/**
4. **https://byjus.com/maths/probability-and-statistics/**

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High]'-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	**Program & Semester II B.Sc. (IIISem)**			
CourseCode	**TITLE OF THE COURSE** **Statistical inference**				
Practical	**Hours Allocated: 30 hrs**	**L**	**T**	**P**	**C**
Pre-requisites:	**Basic knowledge in Sampling concept**	**-**	**-**	**2**	**1**

Conduct any TEN (MS-Excel mandatory):

1. Large sample test for single mean and difference of means
2. Large sample test for single proportion and difference of proportions
3. Large sample test for difference of standard deviations
4. Large sample test for correlation coefficients
5. Small sample test for single mean and difference of means
6. Small sample test for correlation coefficient
7. Paired t-test.
8. Small sample test for single variance(χ 2 - test)
9. Small sample test for difference of variances(F-test)
10. χ 2 - test for goodness of fit and independence ofattributes
11. Nonparametric tests for single sample(run test, sign test and Wilcoxon signed ranktest)
12. Nonparametric tests for related samples (sign test and Wilcoxon signed ranktest)
13. Nonparametric tests for two independent samples (Median test, Wilcoxon –Mann- Whitney - U test)
14. Practicals5, 6, 7, 8, 9, 10 using MS-Excel

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

Virtual Lab Links:

1. https://conjointly.com/kb/descriptive-statistics/
2. https://en.wikipedia.org/wiki/Descriptive_statistics/

Model blue print for the Question Paper setter

Course-III: STATISTICALINFERENCE

Max. Marks: 50 **Time :2 Hrs.**

Module	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	1	2	25
III	1	1	15
IV	1	1	15
V	2	1	20
Total including choice	7	6	95

Pithapur Rajah's Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations - III Semester (w.e.f 2023-24)
For 2022-23 batch
Statistics Course–III: Statistical Inference
Model Paper

Time: 2 Hrs. **Max. Marks: 50**

Answer any THREE of the following. Choosing at least one from each part. **3x10=30M**

SECTION - A

PART- I

1. Define chi square distribution and write its properties..
2. Explain the criteria of a good estimator
3. Explain the Method of Maximum Likelihood Estimation. And state the properties of MLE

PART- II

4. State and prove Neyman- Pearson Lemma.
5. Explain the small sample test for testing the difference of two means
6. Explain Mann Whitney Wilcoxon U test.

SECTION – B

Answer any FOUR of the following: **4x5=20M**

7. Define 1) standard error 2) Parameter 3) Sampling distribution
8. Write the concept of Interval estimation
9. Define null hypothèses, alternative hypothèses ,simple and composite hypothèses
10. Write procedure of test for single mean for large sample.
11. Advantages and disadvantages of non-parametric methods over parametric methods.
12. Explain run test for randomness?
13. Define F-Statistic. state its properties.

Note: Provide Statistical table values wherever necessary

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester II B.Sc. (IVSem) Paper-IV			
CourseCode STT204	TITLE OF THE COURSE Sampling Techniques & Design of Experiments				
Practical	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in methods and Statistical inference	4	-	-	4

Objectives:

The aim of this paper is to introduce you to the statistical aspects associated with the design and analysis of sample surveys, and to develop your understanding of the principles and methods used to design survey sampling schemes.

2. Basic theory underpinning survey inference will be introduced, focusing on methodology for survey-based estimation for population totals and related quantities for some standard sample designs

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Students would be able to learn about the sampling methods
CO2	Students would be able to learn about types of sampling
CO3	Students would be able to learn about simple random sampling
CO4	Students would be able to learn about Anova and Designs
CO5	Students would be able to learn about CRD,RBD,LSD

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

UNIT I (10 hours)

Simple Random Sampling (with and without replacement): Notations and terminology, various probabilities of selection. Random numbers tables. Methods of selecting simple random sample, lottery

method, method based on random numbers. Estimates of population total, mean and their variances and standard errors. **Additional Inputs** : Determination of sample size.

UNIT II (12 hours)

Stratified random sampling: Stratified random sampling, Advantages and Disadvantages of Stratified Random sampling, Estimation of population mean, and its variance. Stratified random sampling with proportional and optimum allocations.Comparison between proportional and optimum allocations with SRSWOR.

Additional Inputs: var($\overline{y_{st}}$) is minimum for fixed total sample size n if n_i& $N_i s_i$

Systematic sampling: Systematic sampling definition when N = nk and merits and demerits of systematic sampling - estimate of mean and its variance.

Additional Inputs: variance of systematic sample mean where intra class correlation coefficient ρ involved.

UNIT III (10 hours)

Analysis of variance: Analysis of variance(ANOVA) –Definition and assumptions. One-way with equal and unequal classification, Two- way classification.

Design of Experiments: Definition, Principles of design of experiments, CRD: Layout, advantages and disadvantages and Statistical analysis of Completely Randomized Design(C.R.D). Cochan's theorem, fixed effect & random effect model.

UNIT IV (10 hours)

Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) with their layouts and Analysis, MissingplottechniqueinRBDandLSD..Efficiency of RBDoverCRD,EfficiencyofLSDoverRBDand CRD.

UNIT V (8 hours)

Factorial experiments – Main effects and interaction effects of $2^2$and 2^3factorial experiments and their Statistical analysis.Additional Inputs: Advantages of factorial experiment.

Textbooks:

1. **B.A/B.Sc III Year Paper-III Statistics- Applied Statistics- Telugu Academy by Prof. K. SrinivasaRao, Dr. D. Giri, Dr. A. Anand, and Dr. V. PapaiahSastry.**
2. **K.V.S. Sarma: Statistics made simple: do it yourself on PC. PHI**
3. **B.A/B.Sc Statistics Applied Statistics, Kalyani Publishers by D.V.L.N. Jogiraju, C. Srikala and L.P. Raj Kumar.**

Reference books:

1. **V.K.Kapoor and S.C.Gupta: Fundamentals of Applied Statistics. Sultan Chand**
2. **ParimalMukhopadhyay: Applied Statistics. New Central Book agency.**
3. **S.P.Gupta: Statistical Methods. Sultan Chand and Sons.**

WebLinks:

https://conjointly.com/kb/descriptive-statistics/
https://en.wikipedia.org/wiki/Descriptive_statistics/

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High] '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester II B.Sc.(IVSem) Paper-IV			
Course Code	TITLE OF THE COURSE Sampling Techniques & Design of Experiments				
Practical	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in methods and Statistical inference	-	-	2	1

Conduct any EIGHT (MS-Excel Mandatory)

Sampling Techniques: Estimation of population mean and its variance by

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

Design of Experiments:

4. ANOVA - one - way classification with equal and unequal number ofobservations
5. ANOVA - Two-way classification with one observation per cell.
6. Analysis ofCRD.
7. Analysis of RBD Comparison of relative efficiency of CRD withRBD
8. Estimation of single missing observation in RBD and itsanalysis
9. Analysis of LSD and efficiency of LSD over CRD andRBD
10. Estimation of single missing observation in LSD and itsanalysis
11. Analysis of 2^2 with RBD layout
12. Analysis of 2^3 with RBDlayout
13. Practicals 4, 5, 6 and 7 using MS-Excel

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

Virtual Lab Links:

1.https://digitalelearnings.com/sampling-and-types-of-sampling**.2.**https://youtu.be/k3lUo0XYG3E

Model blue print for the Question Paper setter

Course-IV: Sampling Techniques & Designs of Experiments

Max. Marks: 50M **Time : 2 Hrs.**

Module	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	2	30
III	1	1	15
IV	1	1	15
V	1	1	15
Total including choice	7	6	95

Pithapur Rajah's Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations - IV Semester (w.e.f 2023-24)
For 2022-23 batch
Statistics Course IV: Sampling Techniques & Design of Experiments
Model Paper

Time: 2 Hrs. **Max. Marks: 50**

Answer any THREE of the following. Choosing at least one from each part. **3x10=30M**

SECTION - A

PART- I

1. Distinguish SRSWR and SRSWOR.
2. In simple random sampling without replacement prove that sample mean square is an unbiased estimation of population mean square i.e. E(s^2)= S^2
3. Explain the method of systematic sampling. Discuss the merits and demerits of systematic sampling.

PART- II

4. Explain the ANOVA for two-way classification.
5. Explain the principles of experimental designs.
6. Explain the statistical analysis of 2^3 experimental design

SECTION – B

Answer any FOUR of the following: **4x5=20M**

7. Write the advantages of sampling over complete enumeration.
8. Define stratified random sampling.
9. List out the basic assumptions involved in ANOVA technique.
10. Explain missing plot technique in LSD
11. Write the advantages of C.R.D.
12. Write the main and interaction effects of 2^2 experimental design.
13. Explain the proportional and optimum allocations.

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester II B.Sc. (IVSem) Paper-V			
CourseCode	TITLE OF THE COURSE APPLIED STATISTICS				
Theory	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical functions	4	-	-	4

Objectives:

1. After completion of this paper the students would be able to learn the applied part of statistics in various disciplines and also learn the opportunities of statistician in different fields.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	**Students would be able to learn about Time series and its components, Determination of trend by least squares, moving averages methods and to determine seasonal indices by Ratio to moving average, ratio to trend and link relative methods.**
CO2	**Students would be able to know the functions and organization of CSO and NSSO, National income and its computation,**
CO3	**Students would be able to know about the definition, uses of vital statistics and its sources, Various mortality and fertility rates, Life tables-its construction and uses.**
CO4	**Students must be able to know about different types of Reproduction rates and abridged life tables.**
CO5	**Students would able to learn applications of it.**

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

UNIT I (10 hours)

Time Series: Time Series and its components with illustrations, additive, multiplicative models. Trend: Estimation of trend by free hand curve method, method of semi averages .Determination of trend by least squares (Linear trend, parabolic trend only), moving averages method.

UNIT II (10 hours)

Seasonal Component: Determination of seasonal indices by simple averages method, ratio to moving average, Ratio to trend and Link relative methods,

Additional input : Deseasonalization.

UNIT III (10 hours)

Growth curves: Modified exponential curve, Logistic curve and Grompertz curve, fitting of growth curves by the method of three selected points and partial sums.

Additional input : Detrending- Effect of elimination of trend on other components of the time series

UNIT IV (10 hours)

Index numbers: Concept, construction, problems involved in the construction of index numbers, uses and limitations. Simple and weighted index numbers .Laspayer's, Paasche's and Fisher's index numbers, Criterion of a good index number, Fisher's ideal index numbers .Cost of living index number and wholesale price index number.

Additional Inputs: Chain Indices.

UNIT V (10 hours)

Vital Statistics: Introduction, definition and uses of vital statistics, sources of vital statistics.

Measures of different Mortality and Fertility rates, Measurement of population growth. Life tables: construction and uses of life tables, Abridged life tables.

Textbooks:

1. **Fundamentals of Applied Statistics: VK Kapoor and SC Gupta**
2. **B.A/B.Sc III year paper-IV Statistics- Applied Statistics- Telugu Academy by Prof K. SrinivasaRao, Dr. D. Giri, Dr A. Anand, Dr V. Papaya Sastry.**
3. **B.A/B.Sc Statistics Applied Statistics, Kalyani Publishers by D.V.L.N. Jogiraju, C. Srikala and L.P. Raj Kumar.**

Reference books:

1. **AnuvartitaSankhyakasastram – Telugu Academy**

Web Links:

1.https://youtu.be/k3lUo0XYG3E

2.https://youtu.be/qSUjVDbKLWQ

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High}'-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester II B.Sc. (IVSem) Paper-V			
Course Code	TITLE OF THE COURSE APPLIED STATISTICS				
Practical	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical functions	-	-	2	1

Conductany *EIGHT (MS-Excel Mandatory)*

Time Series:

1. Measurement of trend by method of moving averages(odd and evenperiod)
2. Measurement of trend by method of Least squares(linear andparabola)
3. Determination of seasonal indices by method simpleaverages
4. Determination of seasonal indices by method of Ratio to movingaverages
5. Determination of seasonal indices by method of Ratio totrend
6. Determination of seasonal indices by method of Linkrelatives

Index Numbers:

7. Computation of simple indexnumbers.
8. Computation of all weighted index numbers.
9. Computation of reversaltests.

Vital Statistics:

10. Computation of various Mortalityrates
11. Computation of various Fertilityrates
12. Computation of various Reproductionrates.
13. Construction of LifeTables
14. Practicals 1, 2, 3, 5, 6, 13 using MS-Excel

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

Virtual Lab Links:

1.https://youtu.be/k3lUo0XYG3E
2.https://youtu.be/qSUjVDbKLWQ
3.https://youtu.be/8DaOIjuF4BY

Model blue print for the Question Paper setter

Course-V: Applied Statistics

Max. Marks: 50 M **Time : 2 Hrs.**

Module	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	1	1	15
II	1	1	15
III	1	1	15
IV	2	1	20
V	2	2	30
Total including choice	7	6	95

Pithapur Rajah's Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations - IV Semester (w.e.f 2023-24)
For 2022-23 batch
Statistics Course V: Applied Statistics
Model Paper

Time: 2 Hrs. **Max. Marks: 50**

Answer any THREE of the following. Choosing at least one from each part. **3x10=30M**

SECTION - A

PART- I

1. Define Time series. Explain the components of time series.
2. Explain the least square method to measure Trend.
3. Explain the method of ratio to trend to measure seasonal variations.

PART- II

4. What are the Problems or steps involved in the construction of Index Numbers?
5. Explain (i) General Fertility Rate. (ii) Specific Fertility Rate. (iii) Total Fertility Rate
6. State the meanings of various columns of a life table and mention the construction of a life table.

SECTION – B

Answer any FOUR of the following: **4x5=20M**

7. Explain the method of moving averages to measure trend.
8. Explain the mathematical models in time series.
9. Explain the method of link relatives.
10. Write a brief note on growth curves.
11. What is meant by base shifting.
12. Explain about Net Reproduction Rate.
13. Explain about the Criteria for Good Index Number

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester III B.Sc. (VSem) Paper-VI			
CourseCode	TITLE OF THE COURSE OPERATIONS RESEARCH – I				
Theory	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical functions	4	-	-	4

Objectives:

The Objective of the paper is to introduce the basic concepts of Operational Research and linear programming to thestudents.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Students would be able to learn about basics of Operation research
CO2	Students would be able to know concepts of optimization techniques
CO3	Students would be able to know about Transportation problems
CO4	Students must be able to know about different types of assignment problems
CO5	Students would able to learn Sequencing methods.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

UNIT-I

Introduction of OR – Origin and development of OR – Nature and features of OR –Scientific Method in OR – Modeling in OR –General Solution methods of OR models – Applications of Operation Research. Linear programming problem (LPP) - Mathematical formulation of the problem - illustrations on Mathematical formulation of Linear programming of problem. Graphical solution of linear programming problems. Some exceptional cases - Alternative solutions, Unbounded solutions, non-existing feasible solutions by Graphical method.

ADDITIONAL INPUT : Advantages and limitations of Models

UNIT-II

General linear programming Problem (GLP) – Definition and Matrix form of GLP problem, Slack variable, Surplus variable, unrestricted Variable, Standard form of LPP and Canonical form of LPP. Definitions of Solution, Basic Solution, Degenerate Solution, Basic feasible Solution and Optimum Basic Feasible Solution. Introduction to Simplex method and Computational procedure of simplex algorithm. Solving LPP by Simplex method (Maximization case and Minimization case)

UNIT-III

Artificial variable technique - Big-M method and Two-phase simplex method, Degeneracy in LPP and method to resolve degeneracy. Alternative solution, Unbounded solution, Non existing feasible solution and Solution of simultaneous equations by Simplex method.

UNIT-IV

Duality in Linear Programming –Concept of duality - Definition of Primal and Dual Problems, General rules for converting any primal into its Dual, Relation between the solution of Primal and Dual problem (statements only). Using duality to solve primal problem. Dual Simplex Method.

ADDITIONAL INPUT : Economic interpretation of duality,

UNIT-V

Post Optimal Analysis - Changes in cost Vector C , Changes in the Requirement Vector b and changes in the Coefficient Matrix A. Structural Changes in a LPP.

Textbooks:

1) Operations Research by Kanthi Swaroopk .GUPTA AND Man Mohan –Sultan Chand

2)Operation Research- S.D Sharma

Reference books:

3) Operation Research – Taha

Web Links:

1.https://youtu.be/k3lUo0XYG3E

2.https://youtu.be/qSUjVDbKLWQ

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High] '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester III B.Sc. (VSem) Paper-VI			
Course Code	TITLE OF THE COURSE OPERATIONS RESEARCH – I				
Practical	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical functions	-	-	2	1

I Practical/Lab to be performed on a computer using OR/Statistical packages

1. To solve Linear Programming Problem using Graphical Method with
   - (i) Unbounded solution
   - (ii) Infeasible solution
   - (iii) Alternative or multiple solutions.
2. Solution of LPP with simplex method.
3. Problem solving using Charnes-M method.
4. Problem solving using Two Phase method.
5. Illustration of following special cases in LPP using Simplex method
   - (i) Unrestricted variables
   - (ii) Unbounded solution
   - (iii) Infeasible solution
   - (iv) Alternative or multiple solutions.
6. Problems based on Principle of Duality.
7. Problems based on Dual simplex method.
8. Problems based on Post OptimalAnalysis.

Reference books:

1) Operations Research by KanthiSwaroopk.GUPTA AND ManMohan –Sultan Chand

2)Operation Research- S.D Sharma

Virtual Lab Links:

1.https://youtu.be/k3lUo0XYG3E
2.https://youtu.be/qSUjVDbKLWQ
3.https://youtu.be/8DaOIjuF4BY

Model blue print for the Question Paper setter

CourseVI-OPERATIONS RESEARCH – I

Max. Marks: 50 **Time : 2 Hrs.**

Module	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	2	30
II	1	1	15
III	1	1	15
IV	2	1	20
V	1	1	15
Total including choice	7	6	95

Pithapur Rajah's Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations - V Semester (w.e.f 2023-24)
For 2021-22 batch
Statistics Course 6A:OPERATIONS RESEARCH
Model Paper

Time: 2 Hrs. **Max. Marks: 50**

Answer any THREE of the following. Choosing at least one from each part. **3x10=30M**

SECTION - A

PART- I

1. Explain about models in O.R
2. Solve the following LPP using Graphical method.

   Max $Z = 3X_1 + 5X_2$

   Subject to constraints $X_1 + 2X_2 \leq 2000$

   $X_1 + X_2 \leq 1500$, $X_2 \leq 600$ and $X_1 \geq 0, X_2 \geq 0$
3. Write a procedure on simplex method

PART- II

4. State and prove fundamental theorem of duality.
5. Explain a bout post optimal analysis.
6. Solve the following using LPP using two phase method.

   Min $Z = X_1 - 2X_2 - 3X_3$

   Subject to constraints;

   $-2X_1 + X_2 + 3X_3 = 2$

   $2X_1 + 3X_2 + 4X_3 = 1$> and $X_1, X_2, X3 > 0$

SECTION – B

Answer any FOUR of the following: **4x5=20M**

7. Define Nature and meaning of O.R.
8. Explain about Mathematical formation of LPP.
9. Define slack, surplus and A.V.
10. Write a procedure on big-m method
11. Explain General rules for converting any primal into its Dual
12. Explain the concept of duality
13. Explain about Structure changes in LPP

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester III B.Sc. (VSem) Paper-VII			
CourseCode	TITLE OF THE COURSE OPERATIONS RESEARCH – II				
Theory	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical functions	4	-	-	4

Objectives:

After completion of this paper the students would be able to learn the applied part of statistics in various disciplines and also learn the opportunities of statistician in different fields.

To enrich the knowledge of students with advanced techniques of linear programming problem along with real life applications.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Students would be able to learn about game theory and its problems
CO2	Students would be able to know concepts of Inventories
CO3	Students would be able to know about Networking
CO4	Students must be able to know about different networking models
CO5	Students would able to learn queuing models

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

UNIT-I

Transportation Problem - Introduction, Mathematical formulation of Transportation problem. Initial Basic feasible solution of Transportation problem - North-West corner rule, Lowest cost entry method, Vogel's approximation method. Method of finding optimal solution-MODI method(U-V method). Degeneracy in transportation problem, Resolution of degeneracy, Unbalanced transportation problem. Maximization TP. Transhipment Problem.

UNIT-II

Assignment Problem - Introduction, Mathematical formulation of Assignment problem, Reduction theorem (statement only), Hungarian Method for solving Assignment problem, Unbalanced Assignment problem.

ADDITIONAL INPUT : The Traveling salesman problem, Formulation of Traveling salesman problem as an Assignment problem and Solution procedure.

UNIT-III

Sequencing problem: Introduction and assumptions of sequencing problem, Sequencing of n jobs and one machine problem. Johnson's algorithm for n jobs and two machines problem-problems with n-jobs on two machines, algorithm for n jobs on three machines problem-problems with n- jobs on three machines, algorithm for n jobs on m machines problem, problems with n- jobs on m-machines.

UNIT-IV

Network Scheduling: Basic Components of a network, nodes and arcs, events and activities– Rules of Network construction – Time calculations in networks - Critical Path Method (CPM) and PERT.TIME COST OPTIMIZATION ALGORTHIM.

UNIT-V

Game Theory: Two- person zero-sum games. Pure and Mixed strategies. Maxmin and Minimax Principles - Saddle point and its existence .Games without Saddle point-Mixed strategies.Solution of 2 x 2 rectangular games. Graphical method of solving 2 x n and m x 2 games. Dominance Property.

Textbooks:

1. **KantiSwaroop, P.K.Gupta and Man Mohan: Operations Research. Sultan Chand.**
2. **Taha: Operations Research: An Introduction: Mac Millan.**

Reference books:

3) Operation Research – Taha

Web Links:

1.https://youtu.be/k3lUo0XYG3E
2.https://youtu.be/qSUjVDbKLWQ

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High] '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

	P.R.GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester III B.Sc. (VSem) Paper-VI			
Course Code	TITLE OF THE COURSE OPERATION RESEARCH-II				
Practical	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical functions	-	-	2	1

I Practical/Lab to be performed on a computer using OR/Statistica lpackages

1. IBFS of transportation problem by using North- West corner rule,Matrix minimum method and VAM
2. Optimum solution to balanced and unbalanced transportation problems by MODI method (both maximization and minimization cases)
3. SolutionofAssignmentproblemusingHungarianmethod(bothmaximizationand minimization cases),
4. Solution of sequencing problem—processing of n jobs through two machines
5. Solution of sequencing problem - processing of n jobs through three machines
6. To perform Project scheduling of a given project (Deterministic case-CPM).
7. To perform Project scheduling of a given project (Probabilistic case-PERT).
8. Graphical method of solving for m x 2 and 2 x n games.
9. Solution of m x n games by dominance rule.
10. Linear programming method for solving m x n games.

Reference books:

1) Operations Research by KanthiSwaroopk.GUPTA AND ManMohan –Sultan Chand 2)Operation Research- S.D Sharma

Virtual Lab Links:

1.https://youtu.be/k3lUo0XYG3E
2.https://youtu.be/qSUjVDbKLWQ
3.https://youtu.be/8DaOIjuF4BY

Model blue print for the Question Paper setter

Course VI -OPERATIONS RESEARCH – II

Max. Marks: 60 **Time : 2 Hrs.**

Module	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	2	30
II	1	1	15
III	1	1	15
IV	1	1	15
V	2	1	20
Total including choice	7	6	95

Pithapur Rajah's Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations - V Semester (w.e.f 2023-24)
For 2021-22 batch
Statistics Course 7A:OPERATIONS RESEARCH-II
Model Paper

Time: 2 Hrs. **Max. Marks: 50**

Answer any THREE of the following. Choosing at least one from each part. **3x10=30M**

SECTION - A

PART- I

1. Explain the procedure for modi method.
2. Write the procedure for Hungarian method.
3. Obtain IBFS for T.P by using VAM.

	D_1	D_2	D_3	D_4	Availability
O_1	11	20	7	8	50
O_2	21	16	10	12	40
O_3	8	12	18	9	70
Requirements	30	25	35	40	

PART- II

4. Explain the sequencing algorithm for n jobs on two machines
5. Find the optimum time of completion of projects, when the time of completion of each task is as follows

A<D,E B,D<F; C<G; B,G<H; F,G<I.

TASK	A	B	C	D	E	F	G	H	I
TIME	23	8	20	16	24	18	19	4	10

6. Write a procedure on graphical method 2xn, mx2 games

SECTION – B

Answer any FOUR of the following: 4x5=20M

7. Explain NWCR method.
8. Explain PERT and CPM.
9. Explain about General Mathematical form of Transportation problems.
10. **Explain about Maxmin and Minimax Principle**
11. Define Two persons zero sum game.
12. Explain about Johnson's algorithm for n jobs and three machines .
13. Solve the following A.P

	I	II	III	IV
A	30	25	26	28
B	26	32	24	20
C	20	22	18	27
D	23	20	21	19

P.R.Government College(A), Kakinada

DEPARTMENT OF STATISTICS

MOOCS

Guidelines:

- Extra credits will be given to the student who will be completed an online course (total credits achieved in the course will be considered)
- The student should submit the course completion certificate with credits to claim the extra credits
- The maximum no. of extra credits is as per guidelines of the college.
- The students may choose online course(s) in the domainof Statistics/Actuarial Science or inter-disciplinary subjects related to thesesubjects
- The students may register and complete a course from the following online platforms
    - https://swayam.gov.in/
    - https://swayam.gov.in/CEC
    - https://swayam.gov.in/NPTEL
    - https://nptel.ac.in/noc/
    - https://swayam.gov.in/UGC
    - https://spoken-tutorial.org/
    - https://www.coursera.org/
    - https://www.coursera.org/programs/iit-madras-48km0
    - Any other
- The students may get extra credits from other sources also. For details contact Academic Cell/Website/Notice Board
- Some suggested courses:

Name of the Course	Web Link
Applied Multivariate Analysis	https://swayam.gov.in/nd2_cec20_ma17/preview
Bio Statistics and Mathematical Biology	https://swayam.gov.in/nd2_cec20_bt23/preview
Big Data Computing	https://swayam.gov.in/nd1_noc20_cs92/preview
Business Statistics	https://swayam.gov.in/nd2_cec20_mg13/preview
Operations Research	https://swayam.gov.in/nd2_cec20_ma19/preview
Research Methodology	https://swayam.gov.in/nd2_cec20_ge37/preview
Quantitative Techniques for Management	https://swayam.gov.in/nd2_cec20_mg18/preview
Communication Research	https://swayam.gov.in/nd2_cec20_ge30/preview
Fundamental of Insurance	https://swayam.gov.in/nd2_cec20_mg24/preview
Introduction to Bio-Statistics	https://swayam.gov.in/nd1_noc20_bt28/preview
Introduction to R Software	https://swayam.gov.in/nd1_noc20_ma53/preview
Non Parametric Statistical Inference	https://swayam.gov.in/nd1_noc20_ma55/preview
Operations Research	https://swayam.gov.in/nd1_noc20_ma45/preview
Regression Analysis	https://swayam.gov.in/nd1_noc20_ma30/preview
Methods and Statistics in Social Sciences Specialization	https://www.coursera.org/specializations/social-science
Statistics with R Specialization	https://www.coursera.org/specializations/statistics
R-Programming	https://www.coursera.org/programs/iit-madras-48km0/browse?productId=RMFRum1BEeWXrA6ju0fvnQ&productType=course&query=r+programming&showMiniModal=true
Hypothesis Testing in Public health	https://www.coursera.org/learn/hypothesis-testing-pub
Business Statistics and Analysis	https://www.coursera.org/programs/iit-madras-48km0/browse?collectionId=&productId=gZBrs7vSEeWQ9xLvZ

Specialization	6r9Zw&productType=s12n&query=r+programming&showMiniModal=true
Probability and Statistics : To p or not to p	**https://www.coursera.org/learn/probability-statistics**
Data Analysis and Interpretation Specialization	**https://www.coursera.org/specializations/data-analysis**
Introduction to Statistics and Data Analysis in Public health	https://www.coursera.org/programs/iit-madras-48km0/browse?productId=wYVFrFUOEeiXDgqeSsw0yA&productType=course&query=data+analysis+public+heaith&showMiniModal=true
Basic Statistics	https://www.coursera.org/programs/iit-madras-48km0/browse?productId=ZNeGqEC2EeWC4g7VhG4bTQ&productType=course&query=statistics&showMiniModal=true

P.R.Government College (Autonomous), Kakinada
Department of Statistics
Certificate Course 01: Statistical Package for Social Sciences (SPSS)

Duration: **40** Hours **No. of Credits(Extra): 01**

Period of the course: During Even Semester

Course Overview:

Introduction to Statistical Analysis Using IBM SPSS Statistics (v24) provides an application-oriented introduction to the statistical component of IBM® SPSS® Statistics. Students will review several statistical techniques and discuss situations in which they would use each technique, the assumptions made by each method, how to set up the analysis, as well as how to interpret the results. This includes a broad range of techniques for exploring and summarizing data, as well as investigating and testing underlying relationships. Students will gain an understanding of when and why to use these various techniques as well as how to apply them with confidence, interpret their output, and graphically display the results.

Objectives:

A good knowledge of quantitative data analysis is a sine qua none for progress in academic and corporate world. Keeping this in mind this course has been designed in such way that students, researchers, teachers and corporate professionals who want to equip themselves with sound skills of data analysis and wish to progress with this skill can learn it in in-depth and interesting manner using IBM SPSS Statistics-one of the earliest and most popular statistical data analysis software package till date.

Learning Outcomes:

On completion of this course the participants will develop an ability to independently analyze and treat data, plan and carry out new research work based on their research interest. The course encompasses most of the major type of research techniques employed in academic and professional research which can be seen in syllabus.

Course Layout:

Unit 1:

Developing the familiarity with SPSS Processer: (10h)

Entering data in SPSS editor.Solving the compatibility issues with different types of file. Inserting and defining variables and cases. Managing fonts and labels.Data screening and cleaning.Missing Value Analysis. Sorting, Transposing, Restructuring, Splitting, and Merging. Compute & Recode functions. Visual Binning & Optimal Binning. Research with SPSS (random number generation).

Unit 2:

Working with descriptive statistics: (8h)

Frequency tables, Using frequency tables for analyzing qualitative data, Explore, Graphical representation of statistical data: histogram (simple vs. clustered), boxplot, line charts, scatter plot (simple, grouped, matrix, drop-line), P-P plots, Q-Q plots, Addressing conditionalities and errors, computing standard scores using SPSS, reporting the descriptive output in APA format.

Unit 3:

Testing the differences between group means: (6h)

t – test (one sample, independent- sample, paired sample), ANOVA- 1 (one way), Reporting the output in APA format.

Unit 4:

Correlation Analysis: (8h)

Data entry for correlational analysis, Choice of a suitable correlational coefficient: non-parametric correlation (Kendall's tau), Parametric correlation (Pearson's, Spearman's), Special correlation (Biserial, Point-biserial), Partial and Distance Correlation

Unit 5:

Regression (Linear & Multiple): (8h)

The method of Least Squares, Linear modeling, Assessing the goodness of fit, Simple regression, Multiple regression (sum of squares, R and R2 , hierarchical, step-wise), Choosing a method based on your research objectives, checking the accuracy of regression model.

- **SPSS Statistics – New User**:

  Key topics

  1. Introduction to statistical analysis

  2. Examine individual variables

  3. Test hypotheses-theory

  4. Test hypotheses about individual variables

  5. Test the relationship between categorical variables

  6. Test the difference between two group means

  7. Test the differences between more than two group means

  8. Test the relationship between scale variables

  9. Predict a scale variable

  10. Explore nonparametric tests

P.R GOVERNMENT (A) COLLEGE, KAKINADA

DEPARTMENT OF STATISTICS

CERTIFICATE COURSE 01: SPSS

Model Paper

Time:2hrsmaxmarks:50

SECTION-A

Answer all questions. Each question carries 1 mark

1. What are the two main windows in SPSS
   a. Data view and variable view b. Data editor and output viewer
   c. Variable view and output viewer d. Data view and output viewer
2. which menu item contains the split file and select cases command
   a. analyze menu b. Graph menu c. Transform menu d. Data menu
3. Select the window where the results of your analysis appear
   a. Output viewer b. Data view c. Data editor d. Variable view
4. In which sub-dialog box can the Chi Square test be found?
   a. Frequencies : percentages b. cross tabs :statistics c. bivariate: pearson d. Gender:female
5. To generate a Spearman's *rho* test, which set of instructions should you give SPSS?
   a. Analyze; Crosstabs; Descriptive Statistics; Spearman; OK
   b. Analyze; Crosstabs; Descriptive Statistics; Spearman; OK
   c. Analyze; Compare Means; Anova table; First layer; Spearman; OK
   d. Analyze; Correlate; Bivariate; [select variables]; Spearman; OK
6. Which of the following is used for creating and defining various characteristics of variables?
   a. Output viewer b. Data view c. Data editor d. Variable view
7. Rating a group of variables on how much you like them is an examples of
   a. Nominal data b. Ordinal data c. Interval data d. ratio data
8. Ordinal level data are characterized by
   a. Equal intervals between each adjacent score. b. A fixed zero
   c. Data that can be meaningfully arranged by order of magnitude d. None of the above.
9. In this tab, rows represent individual cases and columns represent variables in your data.
   a. Output viewer b. Data view c. Data editor d. Variable view
10. which drop down menu do you need to select in order to recode your data.
    a. Transform b. Data c. Analyze d. Graph
11. Which menu item contains the split file and select cases command?
    a. Data Menu b. Transform Menu c. Analyze Menu d. Graph Menu
12. You want to produce a graph that will show the distribution of scores in your data. An appropriate way to display the information would to be use a
    a. Histogram b. Pie chart c. Line chart d. Scatter plot
13. You want to produce a graph that will show the percentages of participants that belonged to different groups

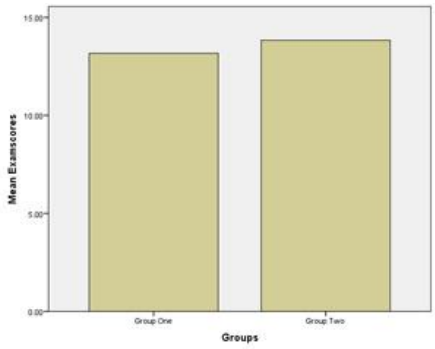
a. Histogram b. Pie chart c. Line chart d. Scatter plot

14. You have collected some demographic data on age groups and would like to produce a pie chart to accompany the descriptive statistics .which of the following commands could produce this pie chart
    a. Frequencies b. Descriptive c. Explore d. Cross tabs
15. Which of these commands enables you to produce a Bar chart of your data
    a. Legacy dialogues b. Chart Builder c. Frequencies command d. All the above
16. What is a research hypothesis?
    a. A predicted relationship between variables b. A theory
    c. A way to describe a sample d. A statement about the normality of the data
17. SPSS stands for which of the following?
    a. Statistical Package for the Social Sciences b. Statistics Problems Solved smart
    c.Simple Package for Science Statistics d. Simple Program for Statistics and Science
18. Boot strapping is a technique that
    a. Can provide an estimation of population parameter
    b. Provides a method of purchasing a sampling distribution
    c. Provides a way of estimating bias of a statistic d. All of these
19. What is the probability of getting head if throwing a coin .
    a. P=0.2 b. P=0.5 c. P=0.05 d. P=0.1
20. Rating a group of vegetables on how much you like them is an example of:
    a. Nominal data b. Ordinal data c. Interval data d. Ratio data

SECTION-B

Answer all questions. Each question carries 3 marks

21. A researcher conducted a study exploring the impact of scary films on individuals' heart rates. The researcher measured individuals' heart rate as they watched a scary film. Measuring heart rate is an example of which level of data (as defined by SPSS)?
    a. Nominal data b. Ordinal data c. Interval data d. Ratio data
22. You have produced a output of a table through the custom tables command. which type of graph you you not create from this table
    a. Bar b. Line c. Histogram d. Area
23. Which of these commands enables you to produce a bar chart of your data
    a. Legacy dialogues b. hart builder c. Frequencies command d. All of the above
24. How would you change the increments on the following graph?



    a. Double click on the graph, and then select Edit and click on Select Y Axis

b. Double click on the graph and then select Edit and click on Select X Axis
c. Double click on the graph and click on the X icon on the toolbar
d. Double click on the graph and then select Options and click on Y Axis Reference Line

25. Which of the following is used for creating and defining various characteristics of variables?
    a. Output viewer b. Variable view c. Data editor d. Data view
26. How is a variable name different from a variable label?
    a. It is shorter and less detailed b. It is longer and more detailed.
    c. It is abstract and unspecific. d. It refers to codes rather than variables.
27. in this tab rows represent variables & columns represent characteristics of variables.
    a. Output viewer b. Variable view c. Data editor d. Data view
28. after selecting the analyse and descriptive statistics dropdown menus,which of the following commands could you use to generate the median and mode for your data .
    a. the frequencies or the explore command b. the descriptives or the frequencies command
    c. the descriptives or the explore command d. the descriptives or the crosstabs command
29. a parameter statistical test with allows you to examine whether there is a difference in the scores between two groups (or) conditions is known as
    a. A Pearson's test b. A chi-square c.A linear regression d. A t-test
30. You have collected some demographic data on age groups and would like to produce a pie chart to accompany the descriptive statistics which of the following commands could produce this pie chart
    a. Frequencies b. Descriptive c. Explore d. Cross tabs

P.R. Government College (Autonomous), Kakinada

Department of Statistics

Certificate Course 02: Descriptive Statistics with 'R' Software

Duration:**40** Hours **No. of Credits(Extra): 01**

Period of the course: During Odd Semester

ABOUT THE COURSE:

Any data analysis is incomplete without statistics. After getting the data, any statistical analysis starts with descriptive statistics which aims to extract the information hidden inside the data. The tools of descriptive statistics are based on mathematical and statistical functions which are to be evaluated using the software. The statistical software are paid as well as free. Most of the statistical software are paid software. Popular free statistical software is R.

Objective of the Course: What are the basic tools of descriptive statistics and how to use the R software for descriptive statistical analysis is the objective of the course to be taught.

Learning Outcomes: After completion of the course, the learners are able apply various tools of 'R' software to analyze descriptive statistics and to derive insights of the data.

INTENDED AUDIENCE:

Any UG student of Science, commerce and Humanities with very basic mathematical and statistical background.

COURSE LAYOUT:

Unit 1: Calculations with R Software: (8 Hrs)

Introduction, Basics, Data Vectors, Matrices, Handling missing data

Unit 2: Introduction to Descriptive Statistics, frequency distribution, Central Tendency of Data: (10 Hrs)

Absolute frequencies, Relative frequencies, Cumulative frequency distribution, Mean, Median, Mode, GM and HM

Unit 3: Variation in Data and Bi-variate data and correlation analysis**:** (12 Hrs)

Range, Quartile deviation, Absolute Deviation, Standard deviation and variance

Correlation analysis of bi-variate data

Unit 4: Graphics and Plots: (10 Hrs)

Bar diagrams, Pie diagrams, kernel density, stem-leaf plots, Box plots, scatter plots.

References:

1. Software for Data Analysis: Programming with R (Statistics and Computing) by John M. Chambers(Spinger)

2. R reference card(PDF)by Tom Short (more can be found under Short Documents and Reference Cards here)

3. Quick-R: quick online reference for data input, basic statistics and plots

4.R programming class on Coursera, taught by Roger Peng, Jeff Leek and Brian Caffo

P.R GOVERNMENT (A) COLLEGE, KAKINADA

DEPARTMENT OF STATISTICS

CERTIFICATE COURSE 02: Descriptive Statistics with R

Model Paper

Time:2hrs
maxmarks:50

SECTION-A

Answer all questions. Each question carries 2 marks

1. The output of the command C(1,2,3,4)*C(1,2) is
   a. 1, 4, 3, 8 b. 1, 4 c. 1, 4, 3, 4 d. Error
2. If x=matrix(nrow = 2, ncol = 2, data = c(1,0,0,1)),then which one of the following relations hold true ?

a. x%*%x-x=x b. x%*%x=x c. x*2=2+x d. x/x=1

3. The outcome of the R command c(3,4,5,6)^c(2,3,1) is

   a. 9 64 5 36 b. 9 64 5 36 with a warning message
   c. 6 12 5 12 d. 6 12 5 12 with a warning message

4. Five cars run between two given points which are at a distance of 10 kilometres. The average of the time taken by these five cars is found and the experiment is repeated 100 times. The nature of variables defined by the "average time" is
   a. discrete b. continuous.c. sometimes discrete and sometimes continuous
   d. not clear as the information is inadequate
5. Which of the following command is to find out the cumulative frequency of a discrete data
   a. cumsum(table(var, seq(a,b, by=c), right=FALSE))
   b. cumsum(table(cut(var, seq(a,b, by=c), right=FALSE)))
   c. cumsum(table(cut(var, right=FALSE)))
   d. cumfreq(table(cut.var, seq(a,b, by=c), right=FALSE))
6. Suppose the number of graduate students in 15 localities are recorded and three such numbers get missed. The collected observations are as
   follows: 104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253.
   Which one of the following is the correct command to obtain the arithmetic mean of this data in R?
   a. mean(c(104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253), na.rm=TRUE)

   b. mean(104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253, na.rm=TRUE)
   c. mean((104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253), na.rm=TRUE)
   d. sum((104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253),

na.rm=TRUE)/length((104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253),

na.rm=TRUE)

7. The arithmetic means and variances of two data sets on volume of medicine on different bottles are obtained as follows. Based on the information provided by the coefficient of variations, which of the data set has more variability?

Data Set	A.M	Variance
I	200	36
II	180	81

   a.Both data sets have the same variability b. Second data set has more variability.

c. First data set has more variability d. Inadequate data to compute the coefficient of variation.

8. The command in R to find absolute mean deviation around median of a data on X is

a. mean(abs(X-median(X))) b. abs(X-median(X))
c. Median(abs(X-median(X))) d. mean deviation(X-median(X))

9. The command in R to get bar diagram with relative frequency data is
a. barplot(table(X)) b. barplot(table(X)/length(X))

c. bardiagram(table(X)) d. bardiagram(table(X)/length(X))

10. The command in R to get a scatter plot for two data vectors X and Y

a. plot(X,Y) b. scatterplot(X,Y) c. lineplot(X,Y) d. barplot(X,Y)

SECTION-B

Answer all questions. Each question carries 3 mark

11. If x is a matrix given by the R command
x = matrix(nrow=3, ncol=3, data=c(1,8,8,10, 12, 4, 12, 18, 16)), the output of t(x)+2*t(x)+t(x)%%t(x) is

a.
```
     [,1] [,2] [,3]
[1,]   36   54   48
[2,]   30   36   12
[3,]   3   24   24
```
b.
```
     [,1] [,2] [,3]
[1,]   3   24   24
[2,]   30   36   12
[3,]   36   54   48
```
c.
```
     [,1] [,2] [,3]
[1,]   36   54   48
[2,]   3   24   24
[3,]   30   36   12
```
d.
```
     [,1] [,2]  [,3]
[1,]   3   30    36
[2,]  24   36    54
[3,]  24   12    48
```

Questions 12 to 14 are based on the following data set.
Following marks out of 100 were given to 200 students in an examination.
marks:
12.1, 80.0, 49.6, 83.5, 76.1, 90.3, 28.6, 45.1, 27.9, 33.7, 86.5, 11.9, 40.8, 41.2, 44.2, 18.5, 27.3, 66.3, 81.8, 42.7, 16.8, 29.6, 80.4, 17.3, 79.2, 52.9, 32.7, 28.2, 80.4, 11.3, 84.0, 8.8, 72.0, 86.6, 97.9, 25.7, 3.5, 23.1, 13.1, 39.1, 9.3, 29.0, 57.1, 33.5, 94.4, 38.4, 95.4, 28.1, 69.0, 14.6, 81.2, 76.5, 44.8, 46.2, 68.4, 8.4, 65.0, 79.2, 23.1, 5.1, 39.1, 35.1, 45.2, 39.3, 91.9, 18.2, 15.8, 61.7, 2.7, 7.5, 78.1, 93.6, 21.5, 64.7, 33.8, 95.6, 81.9, 74.3, 23.0, 5.5, 37.3, 74.4, 93.4, 67.6, 70.4, 84.9, 70.9, 86.0, 45.1, 68.0, 13.7, 73.9, 7.7, 28.8, 41.8, 94.4, 97.8, 4.8, 59.2, 4.0, 57.0, 10.7, 63.4, 82.0, 35.7, 14.3, 9.0, 35.7, 99.6, 53.8, 34.3, 32.1, 38.9, 2.8, 4.6, 88.0, 40.8, 47.5, 40.8, 70.5, 40.5, 50.7, 4.7, 30.5, 96.3, 93.6, 96.1, 79.5, 75.7, 7.5, 14.4, 13.2, 76.5, 90.4, 40.9, 19.1, 38.1, 51.1, 91.4, 8.6, 11.9, 75.7, 31.2, 72.7, 24.0, 40.0, 51.3, 94.1, 6.7, 31.2, 24.9, 39.1, 76.5, 86.6, 68.2, 68.0, 17.3, 80.5, 71.5, 92.9, 1.7, 60.0, 37.3, 74.5, 76.4, 26.8, 26.2, 68.2, 49.1, 38.5, 6.5, 90.0, 80.4, 48.6, 4.2, 51.7, 37.9, 50.4, 40.5, 3.1, 52.9, 16.9, 21.3, 97.5, 96.7, 76.2, 8.6, 52.1, 60.4, 44.3, 1.2, 44.1, 50.6, 67.3, 69.8, 78.5, 14.8, 17.2, 76.2, 44.9

12. The arithmetic mean of the data on marks is

a. 44.85 b. 48.49 c. 65.46 d. 68.34

13. The median of the data on marks is

a. 44.85 b. 48.49 c. 65.46 d. 68.34

14. The 25% and 75% quartiles of the data on marks are

a. 1.200 and 75.800 respectively b. 23.775 and 99.600 respectively
c. 23.775 and 75.800 respectively d. 1.200 and 99.600 respectively

Questions 15 to 17 are based on the following data set.

Following yield (in kilograms) are reported from 200 agricultural fields of same size where 10 values are missing and are expressed as NA. The data is stored in a data vector yieldna:

yieldna:

34.4, 47.0, 19.6, 20.9, NA, NA, 47.2, 28.5, NA, 22.5, 18.3, 46.8, 12.1, 26.4, 28.3, 26.6, 36.8, 40.3, NA, 42.8, 13.7, 17.1, 35.7, NA, 33.7, 20.5, 45.4, 17.5, 29.6, 10.4, 24.4, 27.7, 15.0, 35.0, 22.1, 19.6, 24.3, 45.7, NA, 39.3, 49.7, 31.6, 27.4, NA, 15.9, 12.7, 11.0, 34.5, 37.9, 42.0, 15.5, 16.4, NA, 25.9, 17.5, 29.1, 31.8, 23.1, NA, 31.1, 15.3, 27.5, 34.8, 18.1, 15.4, 41.1, 35.4, 21.3, 17.7, 20.6, 31.2, 37.4, 25.3, NA, 14.7, 11.6, 30.2, 33.1, 43.6, 36.2, 47.8, 30.5, 13.4, 49.8, 26.1, 45.8, 45.1, 21.9, 15.3, 20.6, 10.2, 42.8, 17.0, 43.7, 16.7, 40.6, 30.8, 20.9, 23.7, 38.2, 33.7, 28.8, 23.5, 48.7, 35.8, 17.9, 24.3, 30.5, 45.3, 16.1, 19.2, 16.5, 34.6, 30.1, 17.5, 26.3, 33.3, 22.4, 29.2, 47.6, 11.8, 31.4, 27.7, 46.3, 45.2, 16.5, 40.1, 26.1, 32.3, 13.2, 14.7, 47.0, 45.2, 16.5, 31.3, 47.2, 23.0, 16.4, 48.0, 28.5, 18.8, 10.1, 34.8, 26.1, 46.0, 30.2, 39.1, 11.1, 25.2, 25.5, 23.5, 24.6, 35.6, 11.3, 37.8, 42.6, 30.3, 14.5, 46.3, 26.5, 29.0, 38.5, 19.7, 22.0, 38.2, 40.9, 10.6, 32.1, 36.1, 47.3, 37.6, 20.2, 26.4, 14.9, 15.3, 35.6, 23.9, 26.9, 47.6, 25.4, 19.1, 37.6, 10.4, 37.4, 41.7, 30.3, 22.3, 39.5, 22.2, 41.0, 14.5, 41.9, 29.6, 43.3, 40.3, 46.1, 21.1, 27.8, 20.9, 23.2

15. The absolute mean deviation around median of the data on yieldna is

a. 19.3984 b. 19.638 c. 9.81932 d. 9.398421

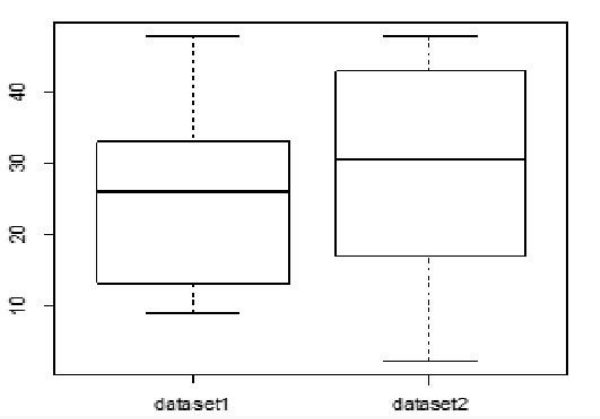
16. The value of variance of the data on yieldna is

a. 131.3516 b. 130.6949 c. 122.6149 d. 120.4329

17. The value of coefficient of variation of the data on yieldna is

a. 0.3833847 b. -0.3833847 c. 2.608346 d. - 2.608346

18. Following are the boxplots of two datasets- dataset1 and dataset 2:



Which of the following statements are correct:

(i) Quartile range of dataset 1 is more than the quartile range of dataset 2.
(ii) Quartile range of dataset 2 is more than the quartile range of dataset 1

(iii) Difference between minimum value of data and its median is smaller in dataset 1 than in dataset 2.
(iv) Difference between minimum value of data and its median is smaller in dataset 2 than in dataset 1.

a. (i) and (iii) b. (i) and (iv) c. (ii) and (iii) d. (ii) and (iv)

19. For the following data weight on the weights of 20 children
2.25, 1.43, 1.31, 9.24, 8.56, 2.61, 5.46, 3.76, 3.47, 2.15, 4.86, 7.26, 4.02, 7.31, 8.56, 8.94, 7.90, 3.90, 1.38, 9.03 ,
the outcome of the R command stem(weight, scale=1) is

a. 1 | 344
2 | 136
3 | 589
4 | 229
7 | 339
8 | 669
9 | 552

b. 1 | 344
2 | 136
3 | 589
4 | 229
7 | 339
8 | 669
9 | 552

c. 1 | 344
2 | 136
3 | 589
4 | 91
5 | 590
6 | 452
7 | 339
8 | 669
9 | 1

d. 1 | 344
3 | 589
5 | 5
7| 339
9| 02

20.Which of the commands are used to find correlation and plotting smooth trend line respectively
a. cor(X,Y) and smooth.scatter(X,Y) b. cor(X,Y) and scatter.smooth(X,Y)
c. cor(X,Y) and plot(X,Y) d. correlation(X,Y) and plot(X,Y)

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