CSSR & SRRM DEGREE AND PG COLLEGE

(Autonomous)

KAMALAPURAM - 516289, KADAPA DISTRICT

BOARD OF STUDIES

Minutes of the Meeting

(2025-2026)

DEPARTMENT OF MATHEMATICS

Dated: 14-06-2025

CONTENT

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PROCEEDINGS OF THE PRINCIPAL
Present: Dr G Vinod Kumar M.Sc., Ph.D., Principal

The Board of studies for Department of Mathematics has been constituted by the Principal of CSSR & SRRM Degree & PG College(A), Kamalapuram as per UGC autonomous 2023 regulations of BoS for the period of three years i.e.,2024-2025 to 2026-2027 with the following members.

SL. No.	Category	Name	Designation	Position in BoS
1	In charge of the Department	T. Pravallika	Head	Chairperson
2	Faculty Member	Dr. G Vinod Kumar	Lecturer	Member
3	Faculty Member	P.V. Pavani	Lecturer	Member
4	Faculty Member	Y. Naga Shilpa Devi	Lecturer	Member
5	Two experts from Outside the Parent University nominated by Academic Council	Dr. S. Balakrishna Department of Mathematics SV College of Engineering Tirupati Ph:8897791466 Email: balakrishna.sr@svcolleges.edu.in	Associate Professor	Subject Expert
6		Dr. Y. Madhusudhan Reddy Department of Mathematics Sri Ramanujan Institute of Technology, Ananthapuram Ph:9494931009 Email: ymsmadhu@gmail.com	Associate Professor	Subject Expert
7	One Expert Nominated by Vice Chancellor	Prof. Madhavi Department of Applied Mathematics Yogi Vemana University, Kadapa Ph:9441593301 Email: lmadhaviyvu@yvu.edu.in	Professor	Subject Expert University Nominee
8	One representative from Industry/Corporate allied areas nominated by the principal	B. Naga Tharun, Managing Director Abhaya Industries, Kamalapuram Ph:9494360201	Industrialist	Member
9	Alumni nominated by the principal	B. Mamatha Lecturer in Mathematics PVSRM Jr College, Kamalapuram Ph:9573326682	Alumni	Member

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AGENDA

1. To Approve the Syllabus, the Model Question Paper for the following courses:

Semester-III

For II BSc Computer Science- (Minor) paper entitled Course II-**Solid Geometry**

For II BSc Botany-Multidisciplinary Course entitled **Basic Mathematics**

For II BBA Course VIII- **Business Statistics & Mathematics**

Semester-IV

For II BSc Computer Science-(Minor) paper entitled:

Course III-**Optimization Techniques**

Course IV- **Vector Calculus**

For BA/BBA/BCom/BSc Multidisciplinary Course entitled "**Basic Statistics**"

2. To Approve List of Examiners and Question Paper Setters.
3. To approve other Academic Activities of the Department.
4. Any discussions with approval of the chair.

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RESOLUTIONS

In BoS meeting the members has unanimously resolved and approved the following items:

1. The members of BoS discussed in the meeting regarding the syllabus and made the changes that mentioned below:
2. The Members also approved the Model Question Paper with some modifications discussed in the meeting.
3. The List of Question Paper Setters and Evaluation Examiners are approved by the BoS Members.
4. The panel members have suggested to perform more academic activities like conferences, seminars through offline mode etc
5. The members instructed to introduce of PG Mathematics

The Modified syllabus by the panel members in the BoS Meeting are:

Sl. No.	Title of the Paper	Modifications	Justification
1	Basic Mathematics (Skill Course)	**UNIT-III** **Limited the Inverse of the Matrix up to 2X2 size** **Removed Rank topic in the Matrices**	**To find the Inverse of a Matric of size 3X# is very hard and time taking for non-maths students.** **Also, the concept if Rank is also difficult**

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II B.SC. (COMPUTER SCIENCE)
SEMESTER-III: MATHEMATICS (MINOR)
COURSE - II: SOLID GEOMETRY

SYLLABUS

Course objectives: Understanding 3D Geometric Concepts, Visualizing and Representing 3D Objects, Applying Geometric Transformations & Relationships, Developing Problem-Solving Skills.

Course Outcomes:
After successful completion of this course, the student will be able to;

CO1: Learn about Direction cosines and Direction rations.
CO2: Identify Plane, system of planes and pair of planes.
CO3: Identify right line, coplanar lines and shortest distance.
CO4: Knowledge related to concept of sphere and cylinder.

UNIT-1: THE PLANE

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Distance between parallel planes, System of Planes. Planes bisecting the angles between two Planes. Pair of Planes.

UNIT–2: THE LINE

Equation of a line; Angle between a line and a plane; The condition for a line to line a plane, Image of a point in a plane, Image of point in a line coplanar Lines Shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines.

UNIT–3: SPHERE-I

Definition and equation of the sphere; the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; great circle, small circle; Intersection of a sphere and a line.

UNIT–4: SPHERE-II

Equation of Tangent plane; Angle of intersection of two spheres; Orthogonal spheres; Radical plane; Coaxial system of spheres; Limiting Points.

UNIT–5: CYLINDER

Definition of a cylinder, Equation to the cylinder, Enveloping cylinder, right circular cylinders equation of the right circular cylinder.

Prescribed Text Book:
V. Krishna Murthy & Others "A Textbook of Mathematics" for BA/B.Sc., Vol 1, Published by S. Chand & Company, New Delhi.

Reference Books:
Scope as in Analytical Solid Geometry by Shanti Narayan and P. K. Mittal Published by S. Chand & Company Ltd. Seventeenth Edition.

Sections: -2.4, 2.5, 2.6, 2.7, 2.8, 3.1 to 3.7, 6.1 to 6.9, 7.1 to 7.4, 7.6 to 7.8.
P. K. Jain and Khaleel Ahmed, "A text Book of Analytical Geometry of Three Dimensions", Wiley Eastern Ltd., 1999.

Co-ordinate Geometry of two and three dimensions by P. Bala subrahmanyam,

K.Y. Subrahmanyam, G.R. Venkataraman published by Tata-MC Gran-Hill Publishers Company Ltd., New Delhi.

II B.SC. (COMPUTER SCIENCE)
SEMESTER-III: MATHEMATICS (MINOR)
COURSE - II: SOLID GEOMETRY

MODEL QUESTION PAPER

Time: 3 hours **Max. Marks: 70**

Section – A

Answer any FIVE questions **(5 x 4 = 20 marks)**

1. $Find\ the\ equation\ of\ the\ plane\ through\ (1,0,-2) and\ perpendicular\ to\ the\ planes\ 2x+y-z-2=0\ and\ x-y-z-3=0.$

2. $The\ equation\ 6x^2+14y^2-10z^2-11xy+3yz+4zx=0\ represent\ a\ pair\ of\ planes\ and\ find\ the\ angle\ between\ them.$

3. $Find\ the\ image\ of\ the\ point\ (1,3,4)\ in\ the\ plane\ 2x-y+z+3=0.$

4. $Find\ the\ equations\ of\ the\ line\ through\ the\ point\ (1,1,1) and\ intersecting\ the\ lines\ 2x-y-z-2=0=x+y+z-1; x-y-z-3=0=2x+4y-z-4.$

5. $Find\ the\ equation\ of\ the\ sphere\ through\ origin\ and\ making\ intercepts\ a,b,c\ on\ the\ axes.$

6. $Find\ the\ points\ of\ intersection\ of\ the\ line\ \frac{x-8}{4}=\frac{y}{1}=\frac{z-1}{-1}\ and\ the\ sphere\ x^2+y^2+z^2-4x+6y-2z+5=0.$

7. $Find\ the\ equation\ of\ the\ tangent\ plane\ to\ the\ sphere\ x^2+y^2+z^2=9\ at\ the\ point (2,-2,1).$

8. $Find\ the\ equations\ of\ the\ spheres\ passing\ through\ the\ circle\ x^2+y^2+z^2=4, z=0\ and\ is\ intersected\ by\ the\ plane\ x+2y+2z=0\ in\ a\ circle\ of\ radius\ 3.$

9. $Find\ the\ equation\ to\ the\ right\ circular\ cylinder\ whose\ axis\ is\ \frac{x-1}{2}=\frac{y-2}{1}=\frac{z-3}{1}\ and\ radius\ is\ 2.$

10. $Find\ the\ equation\ of\ the\ cylinder\ whose\ generators\ are\ parallel\ to\ the\ line\ \frac{x}{1}=\frac{y}{-2}=\frac{z}{3},$ $and\ passing\ through\ the\ curve\ x^2+y^2=16, z=0.$

Section - B

Answer ALL questions **(5 x 10 = 50 Marks)**

11. $Find\ the\ equations\ of\ the\ bisectors\ of\ the\ angles\ between\ the\ planes\ 3x-6y+2z+5=0\ and\ 4x-12y+3z-3=0.$

(or)

12. $Show\ that x^2+4y^2+9z^2-12yz-6zx+4xy+5x+10y-15z+6=0\ represents\ a\ pair\ of\ parallel\ planes\ find\ the\ distance\ between\ them.$

13. $Show\ that\ the\ lines \frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4} and \frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5} are\ coplanar.$

(or)

14.*Find the shortest distance and the equations of S.D between the lines* $\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-3}{1}$; $\frac{x+3}{-3}=\frac{y+7}{2}=\frac{z-6}{4}$.

15.*Find the centre and radius of the circle* $x^2+y^2+z^2-2y-4z-11=0, x+2y+2z-15=0$.

(or)

16.*Show that the plane* $2x-2y+z+12=0$ *touches the sphere* $x^2+y^2+z^2-2x-4y+2z-3=0$. *And also find point of contact.*

17.*Find the limiting points of the coaxial system of spheres determined by the spheres* $x^2+y^2+z^2+3x-3y+6=0, x^2+y^2+z^2-6y-6z+6=0$.

(or)

18.*If* $(-2,1,-1)$ *is a limiting point of the coaxial system for which* $x+y+2z=0$ *is radical plane, then show that the other limiting point is* $(-1,2,-1)$.

19.*Find the equation of the enveloping cylinder of the sphere* $x^2+y^2+z^2-2x+4y-1=0$, *having its generators parallel to the line* $x=y=z$.

(or)

20.*Find the equation to the right circular cylinder whose guiding circle is* $x^2+y^2+z^2=9$, $x-y+z=3$.

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II B.SC. (BOTANY)
SEMESTER-III: MULTIDISCIPLINARY COURSE
BASIC MATHEMATICS

Syllabus

Course Learning Outcomes:
After successful completion of this course, the student will be able to;

CO1: Understand the concept of sets and relations
CO2: Know the Method of rationalisation in surds
CO3: Understand Co-ordinate system and Locus
CO4: Find the Point of intersection of two straight lines
CO5: Find the Rank of a matrix.

UNIT-I: Algebra

Sets and Relations: Sets – Finite and Infinite sets – Equality of sets – Subsets – Power set – Universal set – Union and Intersection of sets – Relations – Equivalence relations –Examples.
Surds: Definition and Examples on Surd-Pure and Mixed Surds-Similar Surds-Monomial Surds-Binomial Surds -Rationalisation.
Logarithms: Definition – Properties of Logarithms – Common Logarithms

UNIT-II: Co-ordinate Geometry

Co-ordinate system: Distance between two points – Division formula – Centroid – Areas of Triangles and Quadrilaterals.
Locus: Definition of Locus – Equation of Locus
Straight Line: Different forms – Reduction of general equation into various forms –Point of intersection of two straight lines

UNIT – III: Matrices

Matrices: Types of matrices – Examples – Addition of Matrices – Subtraction of Matrices – Scalar multiple of a matrix – Multiplication of matrices – Transpose of a matrix and determinants – Minors and Cofactors – Adjoint of a matrix – Inverse of a 2X2 matrix.

Activities:
Seminar/ Quiz/ Assignments/ Problem Solving Sessions.

Reference Books:

- Set Theory and Related Topics, Second Edition, by Seymour, Lipschutz, by Schaum Outlines.
- A Textbook on Analytical Solid Geometry for B.Sc., BA Students, by Shanti Narayan & PK Mittal, S. Chand Publications
- Co-ordinate Geometry by M. L. Khanna, Jai Prakash Nath Publications.
- A Text book of Matrices by Shanti Narayan & PK Mittal, S. Chand Publications.
- A Text book of Matrices by A R Vasishtha, Ak Vasishtha, S. Chand Publications
- Basic Abstract Algebra by P. B. Bhattacharya, S. K. Jain, S. R. Nagpaul, Cambridge University Press.

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II B.SC. (BOTANY)
SEMESTER-III: MULTIDISCIPLINARY COURSE
BASIC MATHEMATICS
MODEL QUESTION PAPER

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

Answer any **FIVE** of the following.
Each question carries 10 Marks.

(5 x 10 =50)

1. (a) Define subsets and power sets.

(b) If A= {1,2,3} and B= {2,3,4}, find $A \cup B$ and $A \cap B$.

2. Simplify the following expressions:

(a) $\frac{\sqrt{6}+\sqrt{2}}{\sqrt{6}-\sqrt{2}}$ (b) $\frac{1}{1+\sqrt{2}}$

3. (a) Solve for x in the equation: $\log_3 2 + \log_3(x-2) = 2$

(b) Expand $\log (2^3 * 3^2 * 5 * 7^2)$ in standard form

4. Find the point that divides the line joining (2,3) and (10,7) in the ratio 3:2 internally.

5. (a) Find the Distance between two points (8,9) & (5, 6)

(b) Find the centroid of the triangle formed by the points (5,3), (6,1) and (7,8)

6. Find the locus of the point which moves such that it remains equidistant from the two fixed points (5,3) & (2,8)

7. (a) Reduce the equation 5x-4y=10 into slope intercept form

(b) Find the equation of the straight line passing through the points (5,6) and (3,8)

8. Find the Point of Intersection of two lines 2x + 3y - 21 = 0, and x + 2y - 13 = 0

9. Given $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix}$

(a) Compute A x B, (b) Transpose of matrices A & B.

10. Find the determinant and the inverse of the matrix $A = \begin{bmatrix} 4 & 7 \\ 2 & 6 \end{bmatrix}$

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II BBA

SEMESTER IV-Bachelor of Business Studies

COURSE 8: BUSINESS STATISTICS AND MATHEMATICS

Course Outcomes:

CO1: Understand the importance of Statistics in real world business applications

CO2: Formulate complete, concise and correct mathematical proofs.

CO3: Frame problems using multiple mathematical and statistical tools, measuring relationships by using standard techniques.

CO4: Build and assess data-based models, learn and apply the statistical tools to business.

CO5: Create quantitative models to solve real world problems in appropriate contexts.

Syllabus

UNIT I: INTRODUCTION TO BUSINESS STATISTICS

Meaning, definition, functions, importance and limitations of Statistics in business context. Methods of Data Collection– Primary and Secondary data. Tools for Data Collection – Schedule and questionnaire. Frequency distribution, Tabulation of Data, Diagram and graphic presentation of data. Statistical System in India.

UNIT II: MEASURES OF CENTRAL TENDENCY AND DISPERSION

Definition, objectives and characteristics of Measures of Central Tendency – Types of Averages – Arithmetic Mean, Geometric Mean, Harmonic Mean. Median, Mode, Quartiles, Deciles and percentiles. Properties of averages and their application. Meaning, definitions, objectives of Dispersion, Range Quartile Deviation, Mean deviation, Standard Deviation. Co-efficient of variation. Definition and objectives of Skewness – Karl Pearson's and Bowle's measures of skewness.

UNIT III: MEASURES OF CORRELATION

Meaning, Definition and use of correlation. Types of Correlation- Karl Pearson's correlation coefficient, Spearman's Rank correlation. Probable error, Meaning and utility of Regression Analysis, comparison between Correlation and Regression, Regression Equations, Interpretation of Regression Co-efficient.

UNIT IV: SET THEORY

Set, Subset, Types of Sets. Operations on sets, De Morgan's Law of Venn Diagram. Applications of Set theory. Laws of Indices, Arithmetic Progressions, Geometric Progressions, Harmonic Progressions.

UNIT V: MATRIX

Meaning and operations, Matrix Algebra. Types of matrices, Matrix addition, Matrix Multiplication. Matrix Determinants, Minors and Co-factors, Matrix inversion.

Reference Books:

1. Sivayya K. V. and Satya Rao, Business Mathematics, Saradhi Publications, Guntur.

2. Sancheti and Kapoor V K., Business Mathematics, Sultan Chand & Sons, New Delhi.

3. D. N. Elhance: Fundamental of Statistics, Kitab Mahal, Allahabad.

4. Gupta S.C. Fundamentals of Business Statistics, Sultan Chand, New Delhi.

5. Aggarwal, Business Statistics, Kalyani Publishers, Hyderabad.

6. Reddy C R, Business Statistics, Deep & Deep Publications, New Delhi.

II BBA
SEMESTER IV-Bachelor of Business Studies
COURSE 8: BUSINESS STATISTICS AND MATHEMATICS

Model Question Paper

Section A (5x4=20Marks)

Answer any FIVE of the following questions.

1. Write any five limitations of statistics when applied to business decisions?
2. Write any four differences between primary and secondary data?
3. Calculate the arithmetic mean for the following data

x_i	2	4	6	8	10	12	14
f_i	4	5	7	9	12	9	3

4. Define Bowley Skewness and formula to find Bowley Skewness?
5. Define Correlation and types of Correlation?
6. Difference between Correlation & Regression
7. Find the value of x, y if the sequence 28, 22, x, y, 4 is an Arithmetic Progression
8. Show that (AUB)' = A'∩B', If U = {1, 2, 3, 4, 5, 6, 7, 8}, A ={3, 4, 5}, B = {4, 5, 6}.
9. If P=$\begin{pmatrix} 1 & 0 & -3 \\ -2 & 5 & 4 \\ 3 & 7 & -4 \end{pmatrix}$, $Q = \begin{pmatrix} 1 & -1 & 8 \\ 6 & -2 & -3 \\ 0 & 3 & 5 \end{pmatrix}$, are two Matrices then find (i) P+Q, (ii) Q-P
10. Find the Determinant of the Matrix $M = \begin{pmatrix} 1 & 1 & 2 \\ -1 & 4 & 5 \\ 3 & 2 & 3 \end{pmatrix}$

Section B (5x10=50Marks)

11.Discuss the various methods of data collection and explain the tools used for collecting primary data.

(Or)

12.Describe the tabulation of data and its significance in business statistics.

13. Find the Median & Mode of the following data.

Class Interval	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	35	52	61	38	29

(Or)

14. Calculate Mean deviation, Quartile deviation, of the data 85, 96, 76, 108, 85, 80, 100, 85, 70, 95

15.Calculate the Correlation Coefficient **r** for the given data.

Class Interval	2-4	4-6	6-8	8-10
Frequency	3	4	2	1

(Or)

16. Calculate Spearman's Rank Correlation Coefficient from the following Marks given by 2 judges?

X	35	40	42	43	40	53	54	49	41	55
Y	102	101	97	98	38	101	97	92	95	95

17.Illustrate De Morgan's laws with examples using Venn diagrams.

(Or)

18. (a) Find a Geometric Progress for which the sum of first two terms is -4 and the fifth term is 4 times the third term.

(b) If the sum of reciprocals of first 11 terms of an HP series is 110, find the 6^{th} term of HP.

19. If A $\begin{pmatrix} -2 & 1 & 1 \\ 4 & 7 & 3 \\ 1 & 0 & -2 \end{pmatrix}$ & B $\begin{pmatrix} 1 & 1 & 3 \\ 1 & 0 & 2 \\ 2 & 0 & 4 \end{pmatrix}$ are two matrices then find AB & BA, justify the relation between AB, BA

(Or)

20. Find the Inverse of the Matrice $\begin{pmatrix} 1 & 0 & -3 \\ -2 & 5 & 4 \\ 3 & 7 & -4 \end{pmatrix}$

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II B.SC. (COMPUTER SCIENCE)
SEMESTER-IV: MATHEMATICS(MINOR)
COURSE - 03: OPTIMIZATION TECHNIQUES

Syllabus

Course Objective: The central objective of optimization is to do thing best under the given circumstances. This general concept has great many applications, for instance, in data analysis, engineering system design, inventory control, man power and resource allocation and building capabilities in the students for analyzing different situations in the industrial/business scenario.

Course Learning Outcomes:
After successful completion of this course, the student will be able to;

CO1: Recall the theoretical foundations of various issues related to linear programming modelling to formulate real-world problems as a LP model

CO2: Explain the theoretical workings of the graphical, simplex and analytical methods for making effective decision on variables so as to optimize the objective function.

CO3: Identify appropriate optimization method to solve complex problems involved in various industries.

CO4: Demonstrate the optimized material distribution schedule using transportation model to minimize total distribution cost.

CO5: Find the appropriate algorithm for allocation of resources to optimize the process of assignment.

CO6: Explain the theoretical workings of sequencing techniques for effective scheduling of job son machine.

UNIT-I

Introduction to Operations Research, Definition of OR, Applications of OR, Limitations of OR, Linear programming problem (LPP), Introduction, Mathematical formulation of the LPP, Applications and Limitation of LPP.

UNIT-II

Linear Programming Problem –Solution of LPP Using Graphical Method and Simplex Method (inequality only).

UNIT-III

Transportation problem: Mathematical formulation, IBFS of transportation problem using north- west corner rule, least- cost rule and Vogel's approximation method, Simple problems.

UNIT-IV

Assignment problem, definition, mathematical formulation of assignment problem, solution of assignment problem using Hungarian algorithm, unbalanced assignment problem, simple problems, Difference between Assignment and transportation Problem.

UNIT-V

Introduction–Definition–Terminology and Notations Principal Assumptions, Problems with n Jobs through Two Machines, Problems with n Jobs through Three Machines

Prescribed Text Book:

A Textbook on Operation Research, Second Edition by R. Pannerselvan, Easter Economy Edition.
Operations Research (2nd Edition) by S.Kalavathi, Vikas Publications Towers Pvt. Ltd. Scope:
UNIT-I:1.1,1.2,1.3,1.5,1.6, 1.7
UNIT-II:2.1,2.2, 2.2.1,2.2.2, 3.1,3.1.1, 4.1,4.2, 4.3
UNIT-III:8.1,8.2, 8.3,8.4.1,8.4.2, 8.4.3
UNIT-IV:9.1,9.2,9.2.1,9.2.2,9.3, 9.4
UNIT-V:12.1, 12.2,12.2.1, 12.2.2,12.3, 12.4

Reference Books:

Operations Research by Kanthi Swaroop, P.K. Gupta, Manmohan by Sultan Chand & Sons

Operations Research by SD. Sharma, Published by Kedhar Nath ram Nath – Meerut.

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II B.SC. (COMPUTER SCIENCE)
SEMESTER-IV: MATHEMATICS(MINOR)
COURSE - 03: OPTIMIZATION TECHNIQUES

MODEL QUESTION PAPER

Time: 3 hours **Max. Marks: 70**

SECTION – A

Answer any FIVE of the following questions. (5x4=20 marks)

1. Define the Limitations of Operation Research.
2. Define the Mathematical Formulation of LPP
3. Define Objective function, Constraints, Non-Negative Restrictions
4. Explain the steps to find the solution using Graphical Method
5. Explain steps to find initial basic feasible solution using North-West Corner Method
6. Explain least cost method to find an initial basic feasible solution.
7. Describe mathematical formulation of assignment problem.
8. Explain un-balanced Assignment problem.
9. State the assumptions in a sequencing problem.
10. Define sequencing problem.

Section - B

Answer ALL questions. Each question carries 10 marks. 5 x 10 = 50 marks

11. Explain different models in OR.

(Or)

12. Describe nature and features of OR.

13. Use the graphical method to solve the following LPP.

Max $Z - 3x + 4y$

Subject to constraints

$$5x + 4y \leq 200$$
$$3x + 5y \leq 150$$
$$5x + 4y \geq 100$$
$$8x + 4y \geq 90$$
$$and\ x, y \geq 0$$

(Or)

14. Explain the Computational procedure of LPP using simplex method.

15.Define optimality test. Explain MODI method to solve transportation problem.

(Or)

16. Solve the following transportation problem by least cost method.

	1	**2**	**3**	**4**	**Supply**
1	4	6	8	9	65
2	2	6	9	4	80
3	4	7	9	5	85
Demand	30	35	60	80	

17.Explain Hungarian method for solving assignment problem.

(Or)

18.Solve the following travelling salesman problem.

	1	**2**	**3**	**4**	**5**
1	-	6	8	5	9
2	6	-	7	5	6
3	8	7	-	6	7
4	5	5	8	-	8
5	5	5	6	8	-

19.We have five jobs, each of which must go through machines A, B and C in the order ABC, processing times (in hours) are given in the following table. Find the total processing time and idle time.

Job	**1**	**2**	**3**	**4**	**5**
Machine A	7	8	10	7	12
Machine B	7	5	4	2	3
Machine C	5	9	7	8	6

(Or)

20.Explain the procedure for sequencing of n' jobs on three machines.

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II B.SC. (COMPUTER SCIENCE)
SEMESTER-IV: MATHEMATICS(MINOR)
COURSE - 04: VECTOR CALCULUS

Syllabus

Course Objective: Vector calculus plays an important role in differential geometry and in study of partial differential equations. It is used extensively in physics and engineering, especially in the description of electromagnetic fields, gravitational fields and fluid flow.

Course Learning Outcomes:
After successful completion of this course, the student will be able to;
CO1: We study the calculus of vector fields.
CO2: Will be able to discuss line integrals and surface integrals also volume integrals.
CO3: Understand the concept of vector differentiation and integration in two- and three-dimensional spaces**.**

UNIT-I: Vector Differentiation–I

Vector Function of Scalar Variable continuity of a vector function partial differentiation scalar point function vector point function – **Gradient of a scalar point Function** – Unit normal – Directional Derivative at a Point – **Angle between two surfaces**.

UNIT-II: Vector Differentiation–II

Vector differential Operator–Scalar Differential Operator–Divergence of a vector–Solenoidal vector – Laplacian operator – curl of a vector – Irrotational Vector – Vector identities.

UNIT -III: Vector Integration- I

Definition – Integration of a vector-simple problems-smooth curve-Line integral -Tangential Integral– circulation Problems online Integral. Surface Integral-Flux Problems on Surface Integral.

UNIT–IV: Vector Integration - II

Volume Integrals–Gauss Divergence Theorem statement and proof–Applications of Gauss Divergence theorem.

UNIT–V: Vector Integration- III

Green's Theorem in a plane Statement and proof–Application of Green's Theorem. Statement and Proof of Stoke Theorem – Application of stoke Theorem.

Prescribed Text books:

A text Book of B.Sc., Mathematics by B.V.S.S. Sarma and others, published by S. Chand & Company Pvt. Ltd., New Delhi.

Reference Books: -

- Vector Calculus by Santhi Narayana, Published by S.Chand & Company Pvt.Ltd., New Delhi.
- Vector Calculus by Tata Macgrhill
- Vector Calculus by R. Gupta, Published by Laxmi Publications.
- Vector Calculus by P.C.Matthews, Published by Springer Verlag publications.

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Kamalapuram, YSR

II B.SC. (COMPUTER SCIENCE)
SEMESTER-IV: MATHEMATICS(MINOR)
COURSE - 04: VECTOR CALCULUS

MODEL QUESTION PAPER

Time: 3 hours **Max. Marks: 70**

SECTION – A

Answer any FIVE of the following questions. (5x4=20 marks)

1. Show that $\nabla^2(\log r) = \frac{1}{r^2}$

2. Find the directional derivative of $\emptyset = xy + yz + zx$ at the point (1,2,0) in the direction of $\bar{\imath} + 2\bar{\jmath} + 2\bar{k}$.

3.If $\bar{F}$is a differentiable vector point function then $div\ (curl\ \bar{F}) = 0$.

4. Show that $\nabla^2\left(\frac{\bar{r}}{r^3}\right) = 0$.

5. Evaluate $\int (e^t\bar{\imath} + e^{-2t}\bar{\jmath} + t\bar{k})\ dt$

6. If $\bar{F} = x^2y^2\bar{\imath} + y\bar{\jmath}, evaluate \oint \bar{F}\ .d\bar{r}\ where\ C\ is\ the\ curve\ y^2 = 4x\ in\ the\ xy -$ $plane\ from\ (0,0) to\ (4,4)$.

7. If F = $2xz\,\mathrm{i} - x\mathrm{j} + y^2\mathrm{k}$ evaluate $\int_V \mathrm{F}.dV$ where V is the region bounded by the surfaces $x = 0,\ x = 2,\ y = 0,\ y = 6,\ z = x^2,\ z = 4$.

8.Compute $\iint (ax^2 + by^2 + cz^2)dS\ over\ the\ sphere\ x^2 + y^2 + z^2 = 1.$

9. Evaluate $\int_C (\cos x \sin y - xy)dx + \sin x \cos y dy$ by Green's theorem where C is the circle $x^2 + y^2 = 1$.

10. By Stoke's theorem prove that $div\ (curl\ \bar{F}) = 0$.

Section - B

Answer ALL questions. Each question carries 10 marks. 5 x 10 = 50 marks

11.If $\bar{r} = a\ cost\ \bar{\imath} + a\ sint\ \bar{\jmath} + at \tan\theta\ \bar{k}\ then\ find$

$$\left|\frac{d\bar{r}}{dt} \times \frac{d^2\bar{r}}{dt^2}\right|\ and\ \left[\frac{d\bar{r}}{dt}\frac{d^2\bar{r}}{dt^2}\frac{d^3\bar{r}}{dt^3}\right]$$

(OR)

12. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9\ and\ x^2 + y^2 - z = 3\ at\ (2,-1,2)$.

13.If $\bar{A}, \bar{B}$ are two differentiable vector point functions then $div(\bar{A} \times \bar{B}) = \bar{B}(curl\, \bar{A} - \bar{A}.(curl\bar{B})$.

(OR)

14.If $f = x^2yz, g = xy - 3z^2, find\ div\ (grad\ f \times grad\ g)$.

15.If $\bar{F} = (x^2 + y^2)\bar{\imath} - 2xy\bar{\jmath}, evaluate\ \oint \bar{F}\ .d\bar{r}$ *where the curve C is the rectangle in the* $xy -$ *plane bounded by* $y = 0, y = b, x = 0, x = a$.

(OR)

16. Evaluate $\iint \bar{F}.\bar{N}\ ds$ *where* $\bar{F} = z\bar{\imath} + x\bar{\jmath} - 3y^2z\bar{k}$ *and S is the surface* $x^2 + y^2 = 16$ *included in the first octant between* $z = 0$ *and* $z = 5$.

17.If $\emptyset = 45\ x^2y, evaluate\ \iiint \emptyset\ dV$ *where V is the closed region bounded by the plane* $4x + 2y + z = 8, x = 0, y = 0, z = 0$.

(OR)

18. State and Prove Gauss Divergence Theorem.

19. State and Prove Green's Theorem.

(OR)

20. State and Prove Stoke's theorem.

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II B.A., BBA., B.Com., B.Sc.
SEMESTER-IV: MULTIDISCIPLINARY COURSE

BASIC STATISTICS

Course Objective: To provide basic understating of general statistical tools and their elementary applications and to create awareness on Indian Statistical System.

Course Learning Outcomes:

After successful completion of this course, the student will be able to;

CO1: To understand the concept of Statistics and its merits and demerits. Distinguishing primary and secondary data. Classification, Tabulation and Pictorial representation of data.

CO2: To understand the basic nature of data and how a single value describes the entire data set. Measuring the degree of departure of a distribution from symmetry and reveals the direction of scatterdness of the items.

CO3: To understand the spread of the data and to draw conclusions from the comparison of averages.

CO4: To understand the concept of correlation and regression and to learn the degree of association between two variables and establishing relationship between the variables.

Syllabus

UNIT-I: Meaning, scope and limitations of Statistics

Collection of data: Primary and Secondary, Classification and Tabulation, Construction of frequency distribution.
Graphical Representation: Bar Diagram, Histogram, Frequency polygon and Pie Chart.

UNIT-II: Measures of Central Tendency:

Arithmetic Mean, Median, Mode. Empirical relationship between Mean Median and Mode. Familiarization of the concept relating to skewness based on central values (definition, merits and Demerits only).

UNIT-III: Measures of Dispersion:

Range, Quartile Deviation (QD), Mean Deviation (MD), Variance, Standard Deviation (SD), relationship between QD, MD and SD. Familiarization of the concepts relating to Correlation and Linear Regression line.

Reference Books: -

1. Statistics (Theory, Methods, Application) D C Sancheti, V K Kapoor, Sultan Chand and Sons, New Delhi
2. Statistical Methods, S.P. Gupta, Sultan Chand and Sons, New Delhi
3. Statistics (Theory and Practice) B.N Gupta, Sahitya Bhavan, Agra

Co-curricular activities:

Objective is to apply the theoretical concept to real life data which enhances the learning and interpretation ability to the current environment.

CoCA I: (i) Collect primary or secondary data and establish frequency distribution.
(ii) Suitable pictorial/ Graphical representation to the established frequency distribution

CoCA II: (i) Select the data and then calculate AM, Median and Mode and interpret the result.
(ii) Calculate the skewness based on central values and interpret the degree of departure of a distribution from symmetry and the direction of scatternets of the items.

CoCA III: (i) Calculate the dispersion values of a data for a single or double data sets and to draw conclusions from the comparison of averages.
(ii) Select the bivariate data (for example, select marks of any two subjects of your course) and calculate the degree of association and establish the linear relationship and find the forecasting value.

II B.A., BBA., B.Com., B.Sc.
SEMESTER-IV: MULTIDISCIPLINARY COURSE
BASIC STATISTICS

Model Question Paper

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

Answer any FIVE of the following.
Each question carries 10 Marks.

(5 x 10 =50)

1. Define Statistics and explain the scope and limitations of statistics.
2. Explain various methods of collecting primary data.
3. Draw a bar diagram for the following data.

Year	2015	2016	2017	2018	2019	2020
Exports	110	156	189	215	234	257
Imports	105	138	204	229	246	250

4. Calculate the mean for the following frequency distribution

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of Students	6	5	8	15	7	6	3

5.Calculate Median for the following data.

Income	0-100	100-200	200-300	300-400	400-500
No. of Workers	7	25	40	20	8

6. Find the mode of the following distribution:
   7,4,3,5,6,3,3,2,4,3,4,3,3,4,4,2,3
7. Explain types of Skewness and measures based on central values.
8. Explain Mean Deviation with merits and demerits.
9. Calculate Quartile Deviation for the following data.

Marks	0-10	10-20	20-30	30-40	40-50
No. of Students	5	23	45	20	7

10. Explain Standard deviation with merits and demerits.

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(Permanently Affiliated to Yogi Vemana University, Kadapa)

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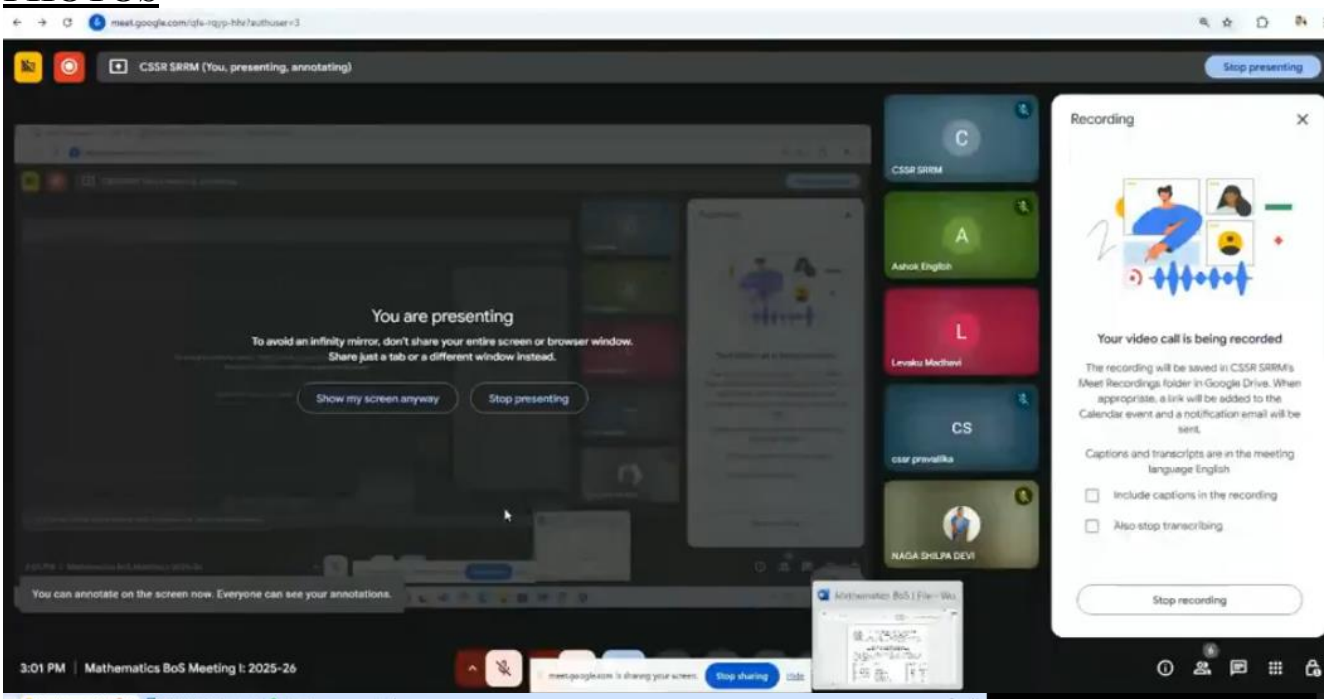

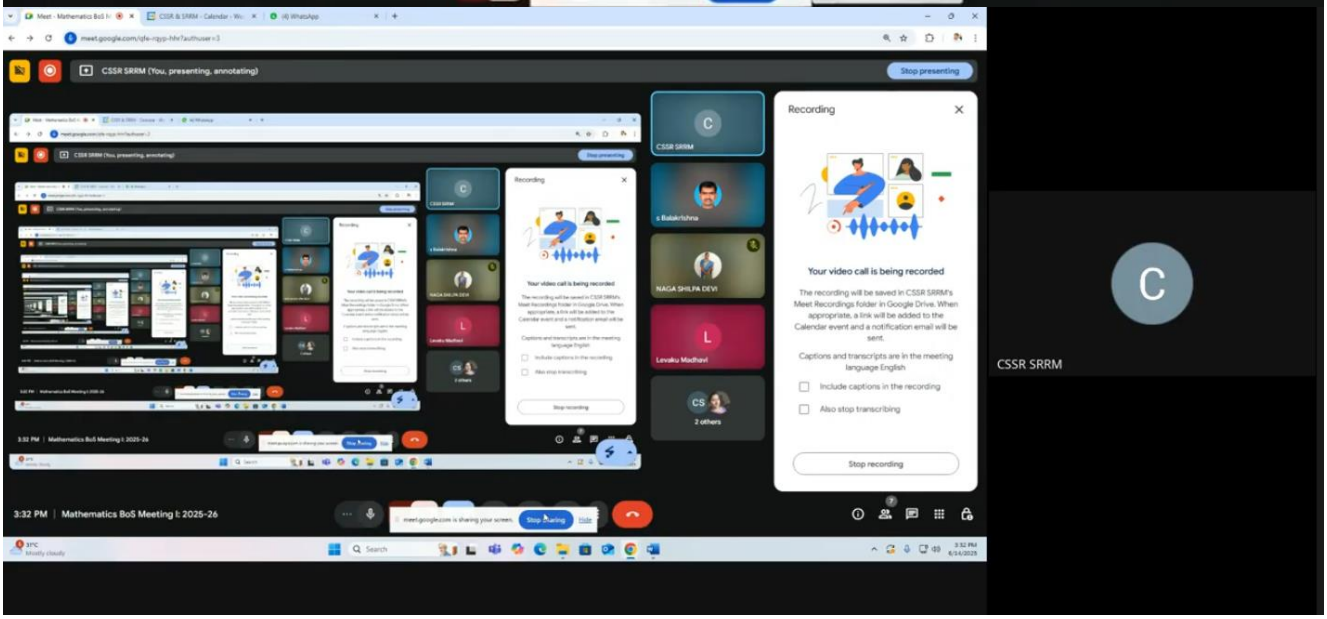

Attendance Sheet:

docs.google.com/spreadsheets/d/1ha7oO5tfQA5xTG1YGJZ6GwUsAeL9fTyVi5FW2R176hc/edit?gid=718518049#gid=718518049

Mathematics BoS Meeting I: 2025-26 - 2025/06/14 14:54 GMT+05:30 - Attendance

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A1 fx First name

	A	B	C	D	E	F	G
1	First name	Last name	Email	Duration	Time joined	Time exited	
2	s	Balakrishna	drsb****@***.com	29 min	3:03 PM	3:32 PM	
3	Ashok	English	asho**********@***.com	6 min	2:59 PM	3:05 PM	
4	Levaku	Madhavi	lmad*******@***.com	35 min	2:57 PM	3:32 PM	
5	Venkata Pavani	Palla	pall**************@***.com	16 min	3:16 PM	3:32 PM	
6	cssr	pravallika	pravallika.mathematics@cssrandsrrmdc.ac.in	35 min	2:58 PM	3:32 PM	
7	NAGA	SHILPA DEVI	shil*********@***.com	36 min	2:56 PM	3:32 PM	
8	CSSR	SRRM	admin@cssrandsrrmdc.ac.in	37 min	2:56 PM	3:32 PM	
9							
10							

Video Link:

https://drive.google.com/file/d/1GH9CGJ1h-lvSkBt63pjESV1ieTE5NOhY/view