

**A.G& S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS &
SCIENCE**

VUYYURU-521165, KRISHNA Dt., A.P.(Autonomous)

Accredited by NAAC with "A" Grade

2021-2022



DEPARTMENT OF MATHEMATICS

MINUTES OF BOARD OF STUDIES

ODD SEMESTER

10-11-2021

Minutes of the meeting of BOS in Mathematics for B.Sc Degree Courses of
AG & SG Siddhartha Degree College of Arts & Science, Vuyyuru, held at 2.30
PM on 10 – 11 – 2021.

N.V. Srinivasa Rao

Presiding

Members Present:

- | | | | |
|-----|---|-----------------------|---|
| 1) | <u>N.V. Srinivasa Rao</u>
(N.V. Srinivasa Rao) | Chairman | Head, Department of
Mathematics,
AG & SG S Degree College. |
| 2) | <u>Dr. K. Jaya Lakshmi</u>
(Dr. K. Jaya Lakshmi) | University
Nominee | Department of Mathematics,
Krishna University,
Machilipatnam. |
| 3) | <u>M. Venkateswara Rao</u>
(M. Venkateswara Rao) | Subject
Expert | Department of Mathematics,
Govt. Degree College,
Avanigadda. |
| 4) | <u>I. V. Venkateswara Rao</u>
(I. V. Venkateswara Rao) | Subject
Expert | Department of Mathematics,
P. B. Siddhartha College,
Vijayawada |
| 5) | <u>D. Sunitha</u>
(D. Sunitha) | Member | Lecturer in Mathematics
AG & SG S Degree College. |
| 6) | <u>A. Bhargavi</u>
(A. Bhargavi) | Member | Lecturer in Mathematics
AG & SG S Degree College. |
| 7) | <u>Noor Mohammad</u>
(Noor Mohammad) | Member | Lecturer in Mathematics
AG & SG S Degree College. |
| 8) | <u>K. Rajya Lakshmi</u>
(K. Rajya Lakshmi) | Member | Lecturer in Mathematics
AG & SG S Degree College. |
| 9) | <u>B. Durga Praveen</u>
(B. Durga Praveen) | Student
Member | III B.Sc M.C.Cs
AG & SG S Degree College. |
| 10) | <u>M. Rose Manasa</u>
(M. Rose Manasa) | Student
Member | III B.Sc M.P.C (E)
AG & SG S Degree College. |

Agenda of B.O.S Meeting:

1. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Mathematics for 1st Semester as per the guidelines and instructions under CBCS prescribed by Krishna University from the Academic Year 2021-22.
2. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Mathematics and Analytical Skills for 3rd Semester as per the guidelines and instructions under CBCS prescribed by Krishna University from the Academic Year 2021-22.
3. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Mathematics for 5th Semester as per the guidelines and instructions under CBCS prescribed by Krishna University from the Academic Year 2021-22.
4. Any other matter.

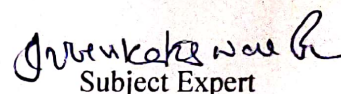
Resolutions.

1. Discussed and recommended that changes are required in Syllabi, Model Question Papers and Guidelines to be followed by the question paper setters in Mathematics for 1st Semesters from the Academic year 2021-22. The maximum marks for IA is 25 and SE is 75. Each IA written examination is of 1 Hr. 30 min duration for 20 marks. The tests will be conducted centrally. The average of two such IA is calculated for 20 marks. 5 marks will be allotted basing on Assignment. There is no minimum passing for IA and there is no provision for improvement in IA. Even though the candidate is absent for two IA exams/obtain zero marks the external marks are considered (if he/she gets 40 out of 75) and the result shall be declared as 'PASS' from the Academic year 2021-22.
2. Discussed and recommended that changes are required in Syllabi, Model Question Papers and Guidelines to be followed by the question paper setters in Mathematics and Analytical Skills for all degree programs of 3rd Semesters from the Academic year 2021-22. The maximum marks for IA is 30 and SE is 70. Each IA written examination is of 1 Hr. 30 min duration for 20 marks. The tests will be conducted centrally. The average of two such IA is calculated for 20 marks. 5 marks will be allotted basing on Assignment and 5 marks are allotted for attendance. There is no minimum passing for IA and there is no provision for improvement in IA. Even though the candidate is absent for two IA exams/obtain zero marks the external marks are considered (if he/she gets 40 out of 70) and the result shall be declared as 'PASS' from the Academic year 2021-22. There is no IA for Analytical Skills and minimum pass marks is 20 out of 50 in SE.
3. Discussed and recommended that no changes are required in syllabi, Model Question Papers and Guidelines for question paper setters in Mathematics for the 5th Semester for the Academic year 2021-22.
4. Discussed and recommended for organizing seminars, Guest lecturers, Online Examinations and Workshops to upgrade the knowledge of students for Competitive Examinations for the approval of the Academic Council.

V. Selvaraj
Chairman


University Nominee

M. Venkatesh
Subject Expert


Subject Expert

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Department of Mathematics

COURSE STRUCTURE

Paper Title :- DIFFERENTIAL EQUATIONS

Semester : I

Course Code	MATT11A	Course Delivery Method	Class Room / Blended Mode - Both
Credits	5	CIA Marks	30
No. of Lecture Hours / Week	6	Semester End Exam Marks	70
Total Number of Lecture Hours	90	Total Marks	100
Year of Introduction : 2018-19	Year of Offering: 2022 - 23	Year of Revision: ----	Percentage of Revision: 0%

Programme Outcomes

S. No	P.O
	At the end of the Programme the student will be able to:
1	Demonstrate the ability to use mathematical skills such as formulating and tackling mathematics related problems and identifying and applying approximate physical principles and methodologies to solve a wide range of problems associated with mathematics.
2	Apply the underlying unifying structures of mathematics and the relationships among them.
3	Investigate and apply mathematical problems and solutions in variety of contexts related to science and technology, business and industry.

Course Outcomes of MATT11A

S. No	C.O	Mapping
	Upon successful completion of this course, students should have the knowledge and skills to:	
1	Determine the solution of differential equations of the first order and of the first degree by Exact, Linear and Bernoulli's method.	L2, PO – 1
2	Understand the basic concepts of first order differential equations to find Orthogonal trajectories.	L2, PO - 1
3	Determine the solution of differential equations of the first order and of a degree higher than first by using methods of solvable for P, X, and Y.	L2, PO - 1
4	Compute all solutions of second and higher order linear differential equations with constant coefficients, linear equations with variable coefficients.	L3, PO – 1
5	Calculate the solutions of higher order differential equations by Cauchy Euler and Variation of parameters.	L2, PO – 1

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MATHEMATICS	MAT T11A	2021 – 22 onwards	B.Sc (MPC, MPCS, MCCS, MSCS)
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DIFFERENTIAL EQUATIONS

SEMESTER-I

No of Credits: 5

OBJECTIVES:

1. Understand all of the concepts relating to the order and linearity of ODEs, analytic and computational solution methods for ODEs, and the real-world applications of ODEs.
2. Apply your understanding of the concepts, formulas, and problem-solving procedures to thoroughly investigate relevant physical models.
3. Explain the concepts of linear systems, ODE solution methods, and related ideas at a fundamental level, as well as how and why we use the solution techniques that we use.

UNIT-I: DIFFERENTIAL EQUATIONS OF FIRST ORDER & FIRST DEGREE (12Hrs)

- 1.1 Linear Differential Equations
- 1.2 Differential Equations Reducible to Linear Form, Bernoulli's differential equations.
- 1.3 Exact Differential Equations
- 1.4 Integrating Factors, $1/Mx+Ny$, $1/Mx-Ny$, $e^{\int f(x)} dx$, $e^{\int g(y)} dy$, and Inspection method
- 1.5 Change of Variables

UNIT-II: ORTHOGONAL TRAJECTORIES & DIFFERENTIAL EQUATIONS OF FIRST ORDER BUT NOT FIRST DEGREE (12Hrs)

- 2.1 Orthogonal Trajectories
- 2.2 Self-Orthogonal Trajectories
- 2.3 Equations solvable for p
- 2.4 Equations solvable for y
- 2.5 Equations solvable for x
- 2.6 Equations Homogeneous in X & Y
- 2.7 Equations that do not contain x (or y)
- 2.8 Clairaut's Equation and Equations reducible to Clairaut's form.

UNIT – III: Higher order linear differential equations-I (12Hrs)

- 3.1 Solution of homogeneous linear differential equations of order n with constant coefficients
- 3.2 Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.
- 3.3 General Solution of $f(D)y=0$
- 3.4 General Solution of $f(D)y=Q$ when Q is a function of x.
- 3.5 $1/f(D)$ is Expressed as partial fractions.
- 3.6 P.I. of $f(D)y = Q$ when $Q = be^{ax}$
- 3.7 P.I. of $f(D)y = Q$ when Q is $b \sin ax$ or $b \cos ax$.

UNIT – IV: Higher order linear differential equations-II (12Hrs)

- 4.1 Solution of the non-homogeneous linear differential equations with constant coefficients.
- 4.2 P.I. of $f(D)y = Q$ when $Q = bx^k$
- 4.3 P.I. of $f(D)y = Q$ when $Q = e^{ax}V$
- 4.4 P.I. of $f(D)y = Q$ when $Q = xV$
- 4.5 P.I. of $f(D)y = Q$ when $Q = x^mV$ where $v = \sin bx$ and $\cos bx$

UNIT-V: Higher order Differential Equations –III (12Hrs)

- 5.1 The Cauchy-Euler Equation.
- 5.2 Linear differential Equations with non-constant coefficients
- 5.3 Method of Variation of parameters.

Student Activities:

- 1) **Class-room activities:** Power point presentations, Assignments
- 2) **Library activities:** Visit to library and preparation of notes for Assignment problems.
- 3) **Activities in the Seminars, workshops and conferences:** Participation/presentation in seminar/workshop/conference.

CO-CURRICULAR ACTIVITIES:

- Quiz Competitions, Seminars
- Group Discussions

WEB LINKS:

https://en.wikipedia.org/wiki/Differential_equation

<https://tutorial.math.lamar.edu/classes/de/de.aspx>

<https://www.mathsisfun.com/calculus/differential-equations.html>

Prescribed Text book:				
S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	V. Krishna Murthy	A text book of Mathematics for B.A/B.ScVol – I	S-Chand&co	2015

Reference books:				
S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dr.A. Anjaneyulu	A text book of mathematics for B.A/B.ScVol – I	Deepthi Publications	2015
2	Rai Singhania	Ordinary& Partial Differential Equations	S-Chand	2009
3	Zafar Ahsan	Differential Equations and their applications	Prentice-Hall of India Pvt Ltd, McGraw Hill	2000

Recommended Question Paper Pattern and Model BLUE PRINT FOR QUESTION PAPER
PATTERN COURSE-I, DIFFERENTIAL EQUATIONS

Unit	TOPIC	S.A.Q(including choice)	E.Q(including choice)	Total Marks
I	Differential Equations of 1 st order and 1 st degree	2	2	28
II	Orthogonal Trajectories, Differential Equations of 1 st order but not of 1 st degree	2	2	28
III	Higher Order Linear Differential Equations (with constant coefficients) – I	2	2	28
IV	Higher Order Linear Differential Equations (with constant coefficients) – II	2	2	28
V	Higher Order Linear Differential Equations (with non-constant coefficients)	2	2	28
TOTAL		10	10	140

S.A.Q. = Short answer questions (4 marks)

E.Q. = Essay questions (10 marks)

Total Marks = 70 M

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COURSE-I, DIFFERENTIAL EQUATIONS

B.Sc MATHEMATICS MODEL PAPER (W.E.F 2022 – 2023)

Time: 3Hrs

Max.Marks:70M

Answer the following questions.

5 x 14 = 70M

1. (a) i) ----- 10 M

ii) ----- 4M

(OR)

(b) i) ----- 10M

ii) ----- 4 M

2. (a) i) ----- 10 M

ii) ----- 4M

(OR)

(b) i) ----- 10M

ii) ----- 4 M

3. (a) i) ----- 10 M

ii) ----- 4M

(OR)

(b) i) ----- 10M

ii) ----- 4 M

4. (a) i) ----- 10 M

ii) ----- 4M

(OR)

(b) i) ----- 10M

ii) ----- 4 M

5. (a) i) ----- 10 M

ii) ----- 4M

(OR)

(b) i) ----- 10M

ii) ----- 4 M

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Autonomous -ISO 9001 – 2015 Certified

Title of the Paper: ABSTRACT ALGEBRA

Semester: III

Course Code	MAT - 301	Course Delivery Method	Class Room / Blended Mode - Both
Credits	5	CIA Marks	30
No. of Lecture Hours / Week	6	Semester End Exam Marks	70
Total Number of Lecture Hours	75	Total Marks	100
Year of Introduction :2021-22	Year of Offering: 2021 - 22	Year of Revision: ---- 2021-22	Percentage of Revision: 0%

Course Outcomes:

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

1. Acquire the basic knowledge and structure of groups, subgroups and cyclic groups.
2. Get the significance of the notation of a normal subgroups.
3. Get the behavior of permutations and operations on them.
4. Study the homomorphisms and isomorphisms with applications.
5. Understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems.
6. Understand the applications of ring theory in various fields.

Course Syllabus:

UNIT – I: GROUPS:

(12 Hours)

Binary Operation – Algebraic structure – semi group- monoid – Group definition and elementary properties

Finite and Infinite groups – examples – order of a group, Composition tables with examples.

UNIT – II: SUB - GROUPS:

(12 Hours)

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition- examples- criterion for a complex to be a subgroups. Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

Co-sets and Lagrange's Theorem :

Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

UNIT –III: NORMAL SUBGROUPS :

(12 Hours)

Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group –quotient group – criteria for the existence of a quotient group.

HOMOMORPHISM :

Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

UNIT – IV: PERMUTATIONS AND CYCLIC GROUPS : (12 Hours)

Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley’s theorem.

Cyclic Groups :- Definition of cyclic group – elementary properties – classification of cyclic groups.

UNIT – V: RINGS : (12 Hours)

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub rings and Ideals (only definitions)

Co-Curricular Activities (15 Hours)

Seminar/ Quiz/ Assignments/ Group theory and its applications / Problem Solving.

Text Book:

A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, published by S.Chand & Company, New Delhi.

Reference Books:

1. Abstract Algebra by J.B. Fraleigh, Published by Narosa publishing house.
2. Modern Algebra by M.L. Khanna.
3. Rings and Linear Algebra by Pundir & Pundir, published by Pragathi Prakashan.

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SEMESTER - III, ABSTRACT ALGEBRA

B.Sc MATHEMATICS MODEL PAPER

Time: 3Hrs

Max.Marks:70M

SECTION - A

Answer any **FOUR** questions. Each question carries **FIVE** marks.
Choosing at least **ONE** question from each part.

4 X 5 M=20 M.

Part – 1

1. Show that the set $G = \{x/ x = 2^a, 3^b \text{ and } a, b \in \mathbb{Z}\}$ is a group under multiplication.
2. Define order of an element of a Group. In a group G if $a \in G$ then $O(a) = O(a^{-1})$.
3. If H and K are two subgroups of a group G , then prove that HK is a subgroup of G
If and only if $HK=KH$
4. If G is a group and H is a subgroup of index 2 in G then prove that H is a normal subgroup.

Part – 2

5. The necessary and sufficient condition for a homomorphism f of a group G on to a group G^1 with kernel K to be an isomorphism of G into G^1 is that $K = \{e\}$
6. Examine whether the following permutations are even or odd
i) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 6 & 1 & 4 & 3 & 2 & 5 & 7 & 8 & 9 \end{pmatrix}$ ii) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 2 & 4 & 5 & 6 & 7 & 1 \end{pmatrix}$
7. Prove that a group of prime order is cyclic.
8. Every field is an integral domain.

SECTION - B

Answer any **FIVE** questions. Each question carries **TEN** marks.
Choosing at least **TWO** question from each part

5 X 10 M = 50 M

Part – 1

9. Show that the set Q_+ of all +ve rational numbers forms an abelian group under the composition defined by “ \circ ” such that $a \circ b = ab/3$ for $a, b \in Q_+$
10. Show that the set of n^{th} roots of unity forms an abelian group under multiplication.
11. The Union of two subgroups is also a subgroup \Leftrightarrow one is contained in the other.
12. State and prove Lagrange’s theorem.

Part – 2

13. Prove that a subgroup H of a group G is a normal subgroup of G iff the product of two right coset of H in G is again a right coset of H in G .
14. State and prove fundamental theorem of homomorphisms of groups.
15. Prove that every subgroup of cyclic group is cyclic.
16. Prove that the characteristic of an integral domain is either prime or zero.

BLUE PRINT FOR QUESTION PAPER PATTERN COURSE-III, ABSTRACT ALGEBRA

Unit	TOPIC	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Groups	2	2	30
II	Subgroups, Cosets & Lagrange's theorem	1	2	25
III	Normal Subgroups and Homomorphism	2	2	30
IV	Permutations and Cyclic groups	2	1	20
V	Rings	1	1	15
Total		8	8	120

S.A.Q. = Short answer questions (5 marks)

E.Q. = Essay questions (10 marks)

Short answer questions : 4 X 5 M = 20 M

Essay questions : 5 X 10 M = 50 M

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Total Marks = 70 M

**A.G & S.G SIDDHARTHA DEGREE COLLEGE OF ARTS AND SCIENCE,
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Title of the Paper: Analytical Skills

Semester: III

Course Code	ANS - 301	Course Delivery Method	Class Room / Blended Mode - Both
Credits	2	CIA Marks	0
No. of Lecture Hours / Week	2	Semester End Exam Marks	50
Total Number of Lecture Hours	30	Total Marks	50
Year of Introduction :2021-22	Year of Offering: 2021 - 22	Year of Revision: ----	Percentage of Revision: 0%

Course Objective: Intended to inculcate quantitative analytical skills and reasoning as an inherent ability in students.

Course Outcomes:

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

- 1) Understand the basic concepts of arithmetic ability, quantitative ability, logical reasoning, business computations and data interpretation and obtain the associated Skills.
- 2) Acquire competency in the use of verbal reasoning.
- 3) Apply the skills and competencies acquired in the related areas
- 4) Solve problems pertaining to quantitative ability, logical reasoning and verbal ability inside and outside the campus.

UNIT – 1

6 Hrs

Test of Reasoning – I:-Coding – Decoding, Direction Test, Interchange of Signs, Logical Venn diagrams, Series Puzzles.

UNIT – 2

6 Hrs

Test of Reasoning – II: - Analogies of numbers and Alphabets completion of blank spaces following the pattern in A: B: C: D relationship odd thing out; Missing number in a sequence or a series.

UNIT – 3

6 Hrs

Arithmetic ability:-Algebraic operations BODMAS, Fractions, Divisibility rules, LCM and GCD (HCF).

Date, Time and Arrangement Problems: Calendar Problems, Clock Problems, Blood Relationship.

UNIT – 4

6 Hrs

Quantitative aptitude: - Averages, Ration and proportion, Problems on ages, Time-distance-speed.

UNIT – 5

6 Hrs

Business computations:- Percentages, Profit & loss, Partnership, simple, compound interest.

Reference Books:

1. Quantitative Aptitude for Competitive Examination by R S Agrawal, S.Chand publications.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude: Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogitaprakasan, Kic X, Kiran Prakasan publishers
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill Publications.
5. Old question Paper of the exams conducted by (Wipro, TCS, Infosys, Etc) at their recruitment process, source-Internet.

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DEPARTMENT OF MATHEMATICS

Analytical Skills

Time: 2 Hrs

Code: ANS – 301

Max. Marks: 50

Min. Marks: 20

Guidelines for Paper setter

To be set all the questions are “Multiple Choice” with four (or) five options.

Section – A

Unit – 1:- Ten questions. Each question carries **ONE** mark 10x1=10M

Unit – 2:- Ten questions. Each question carries **ONE** mark 10x1=10M

Section – B

Unit – 3:- Five questions. Each question carries **TWO** mark 5x2=10M

Unit – 4:- Five questions. Each question carries **TWO** mark 5x2=10M

Unit – 5:- Five questions. Each question carries **TWO** mark 5x2=10M

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MATHEMATICS MAT-501C 2021-22 III B.Sc (MPC, MPCs, MCCs)

SEMESTER-V

PAPER-V

Max.Marks:70

Hours/ Week: 5

No. of Credits: 5

VECTOR CALCULUS & RING THEORY

UNIT – 1: VECTOR DIFFERENTIATION: - (12 hrs)

Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Gradient, divergence, Curl operators, Formulae Involving these operators.

UNIT – 2: VECTOR INTEGRATION: - (12 hrs)

Line Integral, Surface Integral and Volume integral with examples.

UNIT – 3: VECTOR INTEGRATION APPLICATIONS: - (12 hrs)

Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

UNIT – 4: RINGS-I: - (12 hrs)

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring – The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals

UNIT – 5: RINGS-II: - (12 hrs)

Definition of Homomorphism – Homomorphic Image – Elementary Properties of Homomorphism – Kernel of a Homomorphism – Fundamental theorem of Homomorphism
Maximal Ideals – Prime Ideals.

Reference Books:-

1. Abstract Algebra by J. Fraleigh, Published by Narosa Publishing house.
2. Vector Calculus by Santhi Narayana, Published by S. Chand & Company Pvt. Ltd., New Delhi.
3. A text Book of B.Sc., Mathematics by B.V.S.S.Sarma and others, published by S. Chand & Company Pvt. Ltd., New Delhi.
4. Vector Calculus by R. Gupta, Published by Laxmi Publications.
5. Vector Calculus by P.C. Matthews, Published by Springer Verlag publications.
6. Rings and Linear Algebra by Pundir & Pundir, Published by Pragathi Prakashan.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Ring theory and its applications

Chairman

University Nominee

Subject Expert

Subject Expert

A.G & S.G SIDDHARTHA DEGREE COLLEGE: VUYYURU
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DEPARTMENT OF MATHEMATICS

Question Paper Guidelines for SEMESTER-END Examinations

Time: 3 Hrs MAT- 501 C Max.Marks:70 Min. Mark: 28

Note :- 1) Answer any FOUR questions out of 8 in Section-A. Each question Carries 5 marks.
(4x5=20 Marks)

2) Answer any FIVE questions out of 8 in Section-B. Each question Carries 10 marks.
(5x10=50 Marks)

Questions to be set as follows:

Questions to be set as follows:

	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5
<u>Section-A</u> (Short Answer Questions)	2	2	1	2	1
<u>Section-B</u> (Essay Questions)	2	1	2	2	1

Chairman

University Nominee

Subject Expert

Subject Expert

-The End -

EXAMINATION AT THE END OF FIFTH SEMESTER (w.e.f 2020-21)

MATHEMATICS Paper VI MAT- 502C MAX.MARKS: 70 TIME: 3 hrs

LINEAR ALGEBRA

Section – A (short answer questions)

Answer any Four of the following questions.

4x5 = 20M

Choosing at least ONE question from each Part.

Part - I

1) Show that the rank of the transpose of a matrix is equal to the rank of the original matrix. i.e., $\rho(A) = \rho(A^T)$.

2) Find the rank of the matrix $\begin{bmatrix} 1 & -2 & 2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 0 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$ by reducing it in the Normal form

3) If S is a subset of a vector space V(F), then prove that S is a subspace of V $\Leftrightarrow L(S) = S$

4) Let w_1 and w_2 be two subspaces of R^4 given by $w_1 = \{(a,b,c,d) ; b-2c+d=0\}$,

$w_2 = \{(a,b,c,d); a=d, b=2c\}$. Find the basis and dimension (i) w_1 (ii) w_2 (iii) $w_1 \cap w_2$

and hence find the $\dim(w_1 + w_2)$

Part - II

5) Let $T: R^2 \rightarrow R^2$ be a linear transformation defined by $T(1,0)=(1,1), T(0,1)=(-1,2)$ then find a linear transformation T

6) The mapping $T: V_3(R) \rightarrow V_2(R)$ is defined by $T(x, y, z) = (x - y, x - z)$ is a linear transformation.

- 7) State and prove Cauchy – Schwarz’s inequality
- 8) State and prove Triangle inequality

Section – B (long answer questions)

Answer any **FIVE** of the following questions.

5x10 = 50M

Choosing at least TWO questions from each Part.

Part - I

- 9) State and prove Cayley – Hamilton theorem in Matrices.
- 10) Find the characteristic roots and the corresponding characteristic vectors of the matrix

$$A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$$

- 11) Let $V(F)$ be a vector space. A non-empty set $W \subseteq V$. The necessary and sufficient condition for W to be a subspace of V is $a, b \in F$ and $\alpha, \beta \in V \Rightarrow a\alpha + b\beta \in W$
- 12) Let W be a subspace of a finite dimensional vector space $V(F)$ then

$$\dim V/W = \dim V - \dim W.$$

Part - II

- 13) Find the linear Transformation $T(x, y, z)$ where $T : \mathbb{R}^3 \rightarrow \mathbb{R}$ is defined by

$$T(1, 1, 1) = 3, \quad T(0, 1, -2) = 1 \text{ and } T(0, 0, 1) = -2.$$
- 14) State and prove Rank-nullity theorem
- 15) State and prove Bessel’s inequality
- 16) If $(1, 0, 1, 1)$ $(-1, 0, -1, 1)$ $(0, -1, 1, 1)$ forms a basis of a subspace of $\mathbb{R}^4(\mathbb{R})$ use Gram-Schmidt process to obtain an orthonormal basis.

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A.G & S.G SIDDHARTHA DEGREE COLLEGE: VUYYURU-521165

(An Autonomous College in the jurisdiction of Krishna University, Machilipatnam)

MATHEMATICS MAT-502C 2021-22 III B.Sc (MPC, MPCs, MCCs)

SEMESTER-V

PAPER-VI

Max.Marks:70

Hours/ Week: 5

No. of Credits: 5

LINEAR ALGEBRA

UNIT –I Matrix:

(12 hrs)

Matrices, Elementary Properties of Matrices, Triangular form, Echelon form, Normal form Inverse Matrices, Non – Singular form, Rank of Matrix, Linear Equations, Characteristic Roots, Characteristic Vectors of square Matrix, Cayley – Hamilton Theorem.

UNIT – II Vector Spaces-I:

(12 hrs)

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

UNIT –III Vector Spaces-II:

(12 hrs)

Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotient space.

UNIT –IV Linear Transformations:

(12 hrs)

Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

UNIT –V Inner product space:

(12 hrs)

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle in Inequality, Parallelogram law, Orthogonality, Orthonormal set, complete orthonormal set, Gram – Schmidt orthogonalisation process. Bessel’s inequality and Parseval’s Identity.

Reference Books:

1. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna Prakashan Mandir, Meerut- 250002.
2. Matrices by Shanti Narayana, published by S.Chand Publications.
3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi.
4. Linear Algebra by Stephen H. Friedberg et al published by Prentice Hall of India Pvt. Ltd. 4th Edition 2007.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on “Applications of Linear algebra Through Computer Sciences”

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DEPARTMENT OF MATHEMATICS

Question Paper Guidelines for SEMESTER-END Examinations

Time: 3 Hrs MAT- 502 C Max.Marks:70 Min. Mark: 28

Note :- 1) Answer any **FOUR** questions out of 8 in Section-A. Each question Carries 5 marks. (4x5=20 Marks)

2) Answer any **FIVE** questions out of 8 in Section-B. Each question Carries 10 marks. (5x10=50 Marks)

Questions to be set as follows:

Questions to be set as follows:

	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5
<u>Section-A</u> (Short Answer Questions)	2	1	1	2	2
<u>Section-B</u> (Essay Questions)	2	1	1	2	2

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-The End -

**A.G & S.G SIDDHARTHA DEGREE COLLEGE OF ARTS AND SCIENCE,
VUYYURU – 521165, KRISHNA Dt., A.P.
(An Autonomous College in the jurisdiction of Krishna University, Machilipatnam)
EXAMINATION AT THE END OF FIFTH SEMESTER (w.e.f 2020-21)**

MATHEMATICS Paper V MAT- 501C MAX.MARKS: 70 TIME: 3 hrs

(VECTOR CALCULUS AND RING THEORY)

Section – A (short answer questions)

Answer any **Four** of the following questions.

4x5 = 20M

Choosing at least **ONE** question from each Part.

Part - I

- 1) If $r = a \cos t i + a \sin t j + at \tan \theta k$ find $\left| \frac{dr}{dt} \times \frac{d^2r}{dt^2} \right|$ and $\left[\frac{dr}{dt} \frac{d^2r}{dt^2} \frac{d^3r}{dt^3} \right]$
- 2) Find $\text{div } f$ and $\text{curl } f$ where $f = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$.
- 3) If $F = 3xyi - y^2j$ evaluate $\oint_c F \cdot dr$ where 'c' is the curve $y = 2x^2$ in the xy plane from (0, 0) to (1, 2).
- 4) If $F = 2xzi - xj + y^2k$ evaluate the $\int_v F \cdot dv$ where v is the region bounded by the surface $x = 0, x = 2, y = 0, y = 6, z = x^2, z = 4$.

Part - II

- 5) State and prove Green's theorem in a plane.
- 6) Prove that $Z_m = \{0, 1, 2, 3, \dots, m-1\}$ is a ring with respect to addition and multiplication modulo 'm'
- 7) Prove that a field has no Zero divisors.
- 8) If f is homomorphism of a ring R into a ring R^1 then $\text{ker } f$ is an ideal of R

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Section – B (long answer questions)

Answer any **FIVE** of the following questions.

5x10 = 50M

Choosing at least TWO questions from each Part.

Part - I

- 9) Prove that $\text{grad}(A \cdot B) = (B \cdot \nabla)A + (A \cdot \nabla)B + B \times \text{curl} A + A \times \text{curl} B$.
- 10) Evaluate $\int_s F \cdot N ds$ where $F = zi + xj - 3y^2zk$ and s is the surface $x^2 + y^2 = 16$ included in the first octant between $z=0$ and $z=5$.
- 11) State and prove Gauss divergence Theorem.
- 12) Verify Green's Theorem in the plane for $\oint_c (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where c is the region bounded by $y = \sqrt{x}$ and $y = x^2$.

Part - II

- 13) Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point $P(1, 2, 3)$ in the direction of the line PQ where $Q = (5, 0, 4)$.
- 14) Define Field. Prove that every field is an integral domain.
- 15) Prove that $Q(\sqrt{2}) = \{a + b\sqrt{2} / a, b \in Q\}$ is a ring with respect to ordinary addition and multiplication.
- 16) State and prove fundamental theorem of ring homomorphism.

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