

AG & SG Siddhartha Degree College of Arts & Science (Autonomous)

Vuyyuru – 521165, Krishna District, AP.

Accredited 'A' Grade by NAAC



Department of Mathematics

Minutes of the meeting of Board of Studies

08-11-2023

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 3.00
PM on 08 – 11 – 2023 through online mode.

N.V. Srinivasa Rao

Presiding

Members Present:

- 1) *N.V. Srinivasa Rao*
(N.V. Srinivasa Rao) Chairman Head, Department of Mathematics, AG & SG S Degree College.
- 2) *B. Jagan Mohan Rao*
(Dr B. Jagan Mohan Rao) University Nominee Department of Mathematics, Y. V. N. R Govt. Degree college, Kaikaluru.
- 3) *M. Venkateswara Rao*
(M. Venkateswara Rao) Subject Expert Department of Mathematics, Govt. Degree College, Avanigadda.
- 4) *I. V. Venkateswara Rao*
(I. V. Venkateswara Rao) Subject Expert Department of Mathematics, P. B. Siddhartha College, Vijayawada
- 5) *D. Sunitha*
(D. Sunitha) Member Lecturer in Mathematics AG & SG S Degree College.
- 6) *A. Bhargavi*
(A. Bhargavi) Member Lecturer in Mathematics AG & SG S Degree College.
- 7) *Noor Mohammad*
(Noor Mohammad) Member Lecturer in Mathematics AG & SG S Degree College.
- 8) *Ch. Divya*
(Ch. Divya) Student Member III B.Sc M.P.C AG & SG S Degree College.
- 9) *Md. Abrar Ahamed*
(Md. Abrar Ahamed) Student Member III B.Sc MSCs 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 as Single Major for 1st Semester as per the guidelines and instructions prescribed APSCHE and Krishna University from the Academic Year 2023-24.
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 prescribed APSCHE and Krishna University from the Academic Year 2023-24.
3. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Mathematics for 5th/ 6th Semester as per the guidelines and instructions prescribed APSCHE and Krishna University from the Academic Year 2023-24.
4. To discuss and recommend the syllabus of mathematics for new programme MSCs.
5. Any other matter.

Resolutions.

- 1.1. It is resolved and recommended to introduce “**Essentials and Applications of Mathematical, Physical and Chemical Sciences**” with course code **23SCIT11** in I semester of B.Sc. for the students admitted in the academic year 2023 – 24 and onwards.
- 1.2. It is resolved and recommended to introduce “**Advances in Mathematical, Physical and Chemical Sciences**” with course code **23SCIT12** in I semester of B.Sc. for the students admitted in the academic year 2023 – 24 and onwards.
- 1.3. It is resolved and recommended to introduce “**Analytical Skills I**” with course code **23MATSC01** of Skill Course in I semester for all the students admitted in the academic year 2023 – 24 and onwards.
- 1.4. It is resolved and recommended to follow Question paper pattern with MCQ model under the guidelines of APSCHE for Core papers of Mathematics single Major in Semester I in the academic year 2023 – 2024.
2. Discussed and recommended that no changes are required in Syllabi. Changes are required in Model Question Papers and Guidelines to be followed by the question paper setters in Mathematics for 3rd Semesters from the Academic year 2023-24. 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 for attendance and 5 marks are allotted for Assignment/ Activity. 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 2022-23. For Analytical Skills there is 15 marks for IA (There is no minimum passing for IA) and minimum pass marks is 14 out of 35 in SEE.
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/ 6th Semester for the Academic year 2023-24.
4. To introduce new Syllabi, Model Question Papers and Guidelines to be followed by the question paper setters in Mathematics of 5th Semester for new programme MSCs from the Academic year 2023-24. The maximum marks for IA is 25 and SE is 75.
5. 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.

N.V. Srinivas
Chairman.

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Department of Mathematics

Course Structure

A.Y : 2023 – 2024

Sem	Course Code	Course Title	Hours/ Week	CIA	SEE	No. of Credits	Core/LSC/S DC/FC/Elec tive/Cluster
I	23SCIT11	ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES	5	30	70	4	Core
I	23SCIT12	ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES	5	30	70	4	Core
I	23MATSC01	ANALYTICAL SKILLS - I	2	15	35	2	SC
III	22MAT T31	ABSTRACT ALGEBRA	6	25	75	5	Core
III	LSCT03	ANALYTICAL SKILLS	2	10	40	2	LSC
V	MATSET03	MULTIPLE INTEGRALS AND APPLICATIONS OF VECTOR CALCULUS	6	30	70	5	Core
V	MATSET04	INTEGRAL TRANSFORMS WITH APPLICATIONS	6	30	70	5	Core

Department of Mathematics

Paper Title: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Course Code	23SCIT11	Course Delivery Method	Class Room / Blended Mode - Both
Credits	4	CIA Marks	30
No. of Lecture Hours / Week	5	Semester End Exam Marks	70
Total Number of Lecture Hours	75	Total Marks	100
Year of Introduction :2023-24	Year of Offering: 2023 - 2024	Year of Revision: ----	Percentage of Revision: 10 %

SEMESTER-I

Course objectives:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences. The course aims to develop students' critical thinking, problem-solving, and analytical skills in these areas, enabling them to apply scientific principles to real-world situations.

Learning outcomes:

1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors and statistical measures.
2. To explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to connect their knowledge of physics to everyday situations.
3. To Explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to connect their knowledge of chemistry to daily life.
4. Understand the interplay and connections between mathematics, physics and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.

To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities and countermeasures.

UNIT I: ESSENTIALS OF MATHEMATICS:

Complex Numbers: Introduction of the new symbol i – General form of a complex number – Modulus- Amplitude form and conversions.

Functions: Introduction – Ordered Pairs – Function (Definitions) – Inverse Function – Real Valued Functions – Types of Functions – Problems.

Vectors: Definition of vector addition – Cartesian form – Scalar and vector product and problems.

Statistical Measures: Mean, Median, Mode of a data and problems

UNIT II: ESSENTIALS OF PHYSICS:

Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions - Behaviour of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe

UNIT III: ESSENTIALS OF CHEMISTRY:

Definition and scope of chemistry – Importance of chemistry in daily life – branches of chemistry and significance – periodic table – Electronic Configuration, chemical changes, classification of matter, biomolecules – carbohydrates, proteins, fats and vitamins.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY:

Applications of Mathematics in Physics & Chemistry: Calculus, Differential Equations and Complex Analysis.

Application of Physics in Industry and Technology: Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies.

Application of Chemistry in Industry and Technology: Chemical Manufacturing, Pharmaceuticals and Drug Discovery, Materials Science, Food and Beverage Industry.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE:

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, IP, Domain Name Services, applications.

Ethical and social implications: Network and security concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques- Privacy and Data Protection

Recommended books:

- Functions of one complex variable by John.B.Conway, Springer- Verlag.
- Elementary Trigonometry by H.S.Hall and S.R.Knight
- Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media(P)Ltd.
- Basic Statistics by B.L.Agarwal, New age international Publishers
- University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
- Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
- Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and John W. Jewett Jr.
- Physics for Technology and Engineering" by John Bird
- Chemistry in daily life by Kirpal Singh
- Chemistry of bio molecules by S. P. Bhutan
- Fundamentals of Computers by V. Raja Raman
- Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

STUDENT ACTIVITIES

UNIT 1: ESSENTIALS OF MATHEMATICS:

1: Complex Number Exploration

Provide students with a set of complex numbers in both rectangular and polar forms. They will plot the complex numbers on the complex plane and identify their properties.

Give students a set of problems that require the knowledge of functions.

2: Functions

Provide students with a set of vectors in Cartesian form.

Students will perform vector addition and subtraction operations to find the resultant vectors. They will also calculate the scalar and vector products of given vectors.

3: Vector Operations and Applications

Give students a dataset containing numerical values. Students will calculate the mean, median, and mode of the data, as well as other statistical measures if appropriate (e.g., range, standard deviation). They will interpret the results and analyze the central tendencies and distribution of the data.

4: Statistical Measures and Data Analysis

Department of Mathematics

Paper Title: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Course Code	23SCIT12	Course Delivery Method	Class Room / Blended Mode - Both
Credits	4	CIA Marks	30
No. of Lecture Hours / Week	5	Semester End Exam Marks	70
Total Number of Lecture Hours	75	Total Marks	100
Year of Introduction :2023-24	Year of Offering: 2023 - 2024	Year of Revision: ----	Percentage of Revision: 0 %

Semester - I

Course Objective:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences. The course aims to broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Learning outcomes:

1. Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.
2. To explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to connect their knowledge of physics to everyday situations.
3. Understand the different sources of renewable energy and their generation processes and advances in Nano materials and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials.
4. Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of nano sensors. Explore the effects of chemical pollutants on ecosystems and human health.
5. Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
6. Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics. Gain knowledge of different types of transmission media, such as wired (e.g., copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite).

UNIT I: ADVANCES IN BASICS MATHEMATICS

Straight Lines: Different forms – Reduction of general equation into various forms –Point of intersection of two straight lines

Limits and Differentiation: Standard limits – Derivative of a function –Problems on product rule and quotient rule

Integration: Integration as a reverse process of differentiation – Basic methods of integration
Matrices: Types of matrices – Scalar multiple of a matrix – Multiplication of matrices – Transpose of a matrix and determinants

UNIT II: ADVANCES IN PHYSICS:

Renewable energy: Generation, energy storage, and energy-efficient materials and devices. **Recent advances in the field of nanotechnology:** Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.

UNIT III: ADVANCES IN CHEMISTRY:

Computer aided drug design and delivery, nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal - Catalysis method

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

Mathematical Modeling applications in physics and chemistry

Application of Renewable energy: Grid Integration and Smart Grids,

Application of nanotechnology: Nano medicine,

Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics,

Application of medical physics: Radiation Therapy, Nuclear medicine Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check and CRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

Recommended books:

- Coordinate Geometry by S.L.Lony, Arihant Publications
- Calculus by Thomas and Finny, Pearson Publications
- Matrices by A.R.Vasishtha and A.K.Vasishtha, Krishna Prakashan Media(P)Ltd.
- "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
- "Energy Storage: A Nontechnical Guide" by Richard Baxter "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A.Bohara
- "Biophysics: An Introduction" by Rodney Cotterill
- "Medical Physics: Imaging" by James G. Webster
- "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
- Nano materials and applications by M.N.Borah
- Environmental Chemistry by Anil.K.D.E.
- Digital Logic Design by Morris Mano
- Data Communication & Networking by Bahrouz Forouzan.

STUDENT ACTIVITIES:
UNIT I: ADVANCES IN BASIC MATHEMATICS

1: Straight Lines Exploration

Provide students with a set of equations representing straight lines in different forms, such as slope-intercept form, point-slope form, or general form.

Students will explore the properties and characteristics of straight lines, including their slopes, intercepts, and point of intersection.

2: Limits and Differentiation Problem Solving

Students will apply the concept of limits to solve various problems using standard limits.

Encourage students to interpret the results and make connections to real-world applications, such as analyzing rates of change or optimizing functions.

3: Integration Exploration

Students will explore the concept of integration as a reverse process of differentiation and apply basic methods of integration, such as the product rule, substitution method, or integration by parts.

Students can discuss the significance of integration in various fields, such as physics and chemistry

4: Matrices Manipulation

Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose. Students can apply their knowledge of matrices to real-world applications, such as solving systems of equations or representing transformations in geometry.

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Department of Mathematics

Analytical Skills - I

Skill Course

Periods per week: 2

Total periods: 3

Course Code : 23MATSC01

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;

Understand the basic concepts of arithmetic ability, quantitative ability, logical reasoning, business computations and data interpretation and obtain the associated skills.

Acquire competency in the use of verbal reasoning.

Apply the skills and competencies acquired in the related areas

Solve problems pertaining to quantitative ability, logical reasoning and verbal ability inside and outside the campus.

UNIT – 1: (10 Periods)

- Number Series
- Letter series
- Odd man out
- Analogy
- Alpha-numeric series.

UNIT – 2: (10 Periods)

- Coding & Decoding
- Blood relationship
- Clocks
- Calendars.

UNIT – 3: (10 Periods)

- Directions
- Seating arrangements
- Puzzles
- Ranking test.

Text Books:

1. Verbal Reasoning for Competitive Examination by R.S. Agarwal, S.Chand publications.

Reference Books:

1. Arihant's A New Approach to Reasoning by BS Sijwali, Indu Sijwali.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Arihant's How to crack test of Reasoning by Jaikishan, Premkishan.

Links:

1. <https://www.indiabix.com/>
2. <https://www.adda247.com/>
3. https://www.smartkeeda.com/test/Quantitative_Aptitude/R_Updated/all/

- ❖ 15 marks for surprise tests/online tests
- ❖ 35 marks for semester end examination (objective type). Each question carries half mark only.

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Department of Mathematics

Paper Title: **ABSTRACT ALGEBRA**

Semester - III

Course Code	22MATT31	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 :2022-23	Year of Offering: 2022 - 2023	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 22MATT31

S. No	C.O	Mapping
	Upon successful completion of this course, students should have the knowledge and skills to:	
1	Understand concepts of groups and its properties.	L2, PO –1
2	Determine subgroups and whether the given subsets of a group are subgroups.	L4, PO - 1
3	Explain the significance of cosets, normal subgroups and factor groups.	L2, PO - 2
4	Determine group homomorphisms and isomorphisms.	L4, PO – 1
5	Find cycles of a given permutations and understand the properties of cyclic groups.	L1, PO – 2

ABSTRACT ALGEBRA

SEMESTER-III

No of Credits: 5

OBJECTIVE: TO ENHANCE THE DATA EVALUATIONAL SKILLS, LOGICAL THINKINGNESS OF THE STUDENT

UNIT-I : GROUPS

(16hrs)

- 1.1 Binary Operation, Semi group, Algebraic Structure, Monoid, Cancellation laws, Group definition, Abelian group, Elementary Properties
- 1.2 Finite and Infinite groups with examples, Order of a group with examples
- 1.3 Addition modulo m – Definition – theorem – Problems
- 1.4 Multiplication Modulo P – definition- $\{1, 2, 3, \dots, p-1\}$ where P is a prime number is a group – theorem – Problems
- 1.5 Order of an element of a group – Definition – Theorems.

UNIT-II: SUB GROUPS

(20 hrs)

- 2.1 Complex definition, Multiplication of two complexes, Inverse of a complex, subgroup definition, Identity and Inverse of a subgroup
- 2.2 Criterion for a complex to be a subgroup, Criterion for the product of two subgroups to be a subgroup
- 2.3 Union and Intersection of subgroups.
- 2.4 Cosets Definition – Properties of cosets.
- 2.5 Index of a subgroups of a finite groups, Lagrange's Theorem.

UNIT-III: NORMAL SUBGROUPS

(18 hrs)

- 3.1 Definition of a normal subgroup, Proper and improper normal subgroups
- 3.2 Intersection of two normal subgroups, Subgroup of index 2 is a normal subgroup, Simple group
- 3.3 Quotient group, Criteria for the existence of a Quotient group

UNIT-IV: HOMOMORPHISM

(16hrs)

- 4.1 Definition of a Homomorphism, Image of a Homomorphism, Properties of a Homomorphism
- 4.2 Isomorphism, Automorphism definitions and elementary properties
- 4.3 Kernel of a homomorphism, Fundamental theorem on homomorphism of groups and applications
- 4.4 Inner automorphism, Outer automorphism.

UNIT-V: PERMUTATIONS AND CYCLIC GROUPS**(20 hrs)**

- 5.1 Definition of a permutation group, Equal permutations, Permutation multiplications, Order of a permutation, Inverse of a permutation, Orbits and cycles of permutation
- 5.2 Transposition, Even and odd permutations – Theorem – Related Problems.
- 5.3 Cayley's theorem – Related Problems.
- 5.4 Definition of a cyclic group – Properties of Cyclic group
- 5.5 Standard theorems on cyclic groups – related problems.

Prescribed Text book:				
S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	V. Venkateswara Rao, BVSS Sharma, S. AnjaneyaSastry & Others	A text book of mathematics for B.A/B.ScVol – I	S-Chand & Co Ltd.,	2014

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	M.L.Khanna	Modern Algebra	Jaya Prakashnadh & Co	2012

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Department of Mathematics

Analytical Skills - I

Skill Course

Periods per week: 2

Total periods: 30

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;
Understand the basic concepts of arithmetic ability, quantitative ability, logical reasoning, business computations and data interpretation and obtain the associated skills.

Acquire competency in the use of verbal reasoning.

Apply the skills and competencies acquired in the related areas

Solve problems pertaining to quantitative ability, logical reasoning and verbal ability inside and outside the campus.

UNIT – 1: (10 Periods)

- Number Series
- Letter series
- Odd man out
- Analogy
- Alpha-numeric series.

UNIT – 2: (10 Periods)

- Coding & Decoding
- Blood relationship
- Clocks
- Calendars.

UNIT – 3: (10 Periods)

- Directions
- Seating arrangements
- Puzzles
- Ranking test.

Text Books:

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3. https://www.smartkeeda.com/test/Quantitative_Aptitude/R_Updated/all/

- ❖ 15 marks for surprise tests/online tests
- ❖ 35 marks for semester end examination (objective type). Each question carries half mark only.

SEMESTER – III

Model Paper

COURSE CODE : 22MATT31

TITLE OF THE PAPER : ABSTRACT ALGEBRA

Time: 3hrs.

Max. Marks: 70M

Section – A

Answer all the questions

(5x4=20)

1. a) In a group G , Show that the inverse of an element is unique. (L2,CO1)
(OR)
b) Prove that the cancellation laws hold in a Group. (L2,CO1)
2. a) H is a non-empty complex of a group G . The necessary and sufficient condition for H to be a sub group of G is $a, b \in H \Rightarrow ab^{-1} \in H$. (L4,CO2)
(OR)
b) Let G be a group and H be a subgroup of G . Then prove that every left coset of H in G is a right coset of H in G . (L4,CO2)
3. a) Show that every subgroup of an abelian group is normal. (L2,CO3)
(OR)
b) Prove that every Quotient group of an abelian group is abelian. (L2,CO3)
4. a) Define Isomorphism and Automorphism. (L4,CO4)
(OR)
b) If ' Γ ' is a homomorphism of a group G into a group G' , then show that the Kerf is a normal subgroup of G . (L4,CO4)
5. a) Find the regular permutation group isomorphic to the multiplicative group $\{1, -1, i, -i\}$.
(L1,CO5)
(OR)
b) Prove that every cyclic group is abelian. (L1,CO5)

Section – B

Answer ALL questions.

(5 x 10 = 50)

Unit - I

6.a) Prove that the set Z of all integers from an abelian group w.r. to the operation defined by $a * b = a+b+2 \forall a, b \in Z$. (L2,CO1)

(OR)

b) Prove that $G = \{0,1,2,3,4,5\}$ is an abelian group w.r.t. addition modulo 6. (L2,CO1)

Unit – II

7. a) Prove that the union of two sub groups of a group G is a sub group of G if and only if one is contained in the other. (L4,CO2)

(OR)

b) State and prove Lagrange's theorem on groups. (L4,CO2)

Unit – III

8. a) If H is a normal subgroup of a group G , then prove that the set of all cosets of H in G is a group with respect to coset multiplication. (L2,CO3)

(OR)

b) Prove that H is a normal subgroup of a group G iff product of two right cosets of H is again a right coset of H . (L2,CO3)

Unit – IV

9. a) State and Prove Fundamental Theorem of Homomorphism. (L4,CO4)

(OR)

b) Let 'a' be a fixed element of a group G . Prove that the mapping $f_a : G \rightarrow G$ defined by $f_a(x) = a^{-1}xa \forall x \in G$ is an automorphism of G . (L4, CO4)

Unit - V

10. a) Prove that every finite group G is isomorphic to a permutation group. (L1,CO5)

(OR)

b) Prove that every subgroup of a cyclic group is cyclic. (L1,CO5)

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LIFE SKILL COURSE	LSCT03	2023 -'24	MPCs, MSCs, MCCs
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SEMESTER – III

Credits: 2

(Total 30 Hrs)

ANALYTICAL SKILLS

- CO1: After studying this chapter student update them to analyze the data in Graphs, tables, passages etc.
- CO2: After studying this chapter student understand to find missing object in a sequence and analyze the objects. And also the student easily identify the family relations, find the day of the week for a particular date and improve the calculations in an easy way.
- CO3: After studying this chapter student understand the age related problems and how to calculate speed in different methods and also the student can update themselves to solve business related problems and banking related problems.

UNIT – 1 (5 Hours)

Data Interpretation:-The data given in a Table, Graph, Bar Diagram, Pie Chart, Venn diagram or a passage is to be analyzed and the questions pertaining to the data are to be answered.

UNIT – 2 (10 Hours)

Verbal Reasoning:- 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. Coding & Decoding. Calendar Problems, Clock Problems, Blood Relationship

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

.UNIT - 3 (15Hours)

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

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, Pratogita prakasan, 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.

Note: The teachers/students are expected to teach /learn the contents by not converting them to the problems of algebra at the maximum possible extent, but to use analytical thinking to solve the exercises related to those topics. This is the main aim of the course.

6. What is the value of $0.99999\dots$ in the form of p/q ?
- a)1 b)1.2 c)2/3 d)7/9 e)None
7. $(4 \times 4 \times 4 \times 4) \div (4 \times 4 \times 4) + 4 = ?$
- a)20 b)4 c)14 d)3/4 e)None
8. Find the square root of 3721
- a)49 b)51 c)61 d)59 e)None
9. Difference of any two even numbers..
- a)Odd b)Even c)Prime d)Composite e)None
10. Find the least value of '*' so that the number $12*25253$ is divisible by 3
- a)3 b)4 c)1 d)2 e)None
11. What is the units place in 2528^{2529}
- a)7 b)1 c)8 d)9 e)None of These
12. Find the LCM of 28, 35, 56 and 84
- a)840 b)140 c)255 d)250 e)None
13. LCM and HCF of two numbers is 180 and 20 respectively. One of the two numbers is 30. find the another number..
- a)100 b)90 c)120 d)70 e)150
14. Find the total number of factors of 169 ?
- a)1 b)2 c)3 d)9 e)None

Directions (Q.No:15 to 19): These questions are based on the data in the following table, study it carefully and answer the questions given below it.

Population (in Lakh) of various states over the years

Years	STATES									
	A	B	C	D	E	F	G	H	I	J
2000	56	37	62	48	63	53	71	69	53	73
2001	64	42	60	46	64	56	72	72	52	75
2002	70	39	63	45	61	52	69	73	55	76
2003	69	43	61	47	65	55	73	68	54	77
2004	73	40	65	49	62	54	71	67	57	79
2005	65	45	66	52	63	58	74	75	56	80

2006	72	47	69	51	60	57	72	74	58	81
2007	77	52	67	52	64	59	75	76	59	83
2008	76	50	68	53	66	60	76	78	60	84
2009	75	53	70	50	68	61	74	77	62	85

15. The population of which state was the highest in the year 2003?

- a)A b)E c)I d)J e)None

16. The population of state C in 2007 was equal to the population of which state in 2004?

- a)A b)H c)I d)J e)None

17. What was the difference between the population of state C in 2007 and state E in 2002

- a)6 lakhs b)7 lakhs c)4 lakhs d)5 lakhs e)None

18. Which state had the lowest population in 2009?

- a)C b)B c)D d)A e)None

19. The population of state 'I' was the lowest in which year?

- a)2008 b)2009 c)2001 d)2000 e)None

20. If $A:B=3:5$ and $B:C=5:3$. Find $A:B:C$?

- a)15:25:15 b)4:5:3 c)3:5:3 d)9:12:20 e)None

21. Rs.189 has been divided among A,B,C in the ratio 2:3:4. What is the share of A?

- a)Rs.48 b)Rs.32 c)Rs.54 d)Rs.42 e)None

22. The salaries of A,B,C are in the ratio 3:5:7. If the increments of 15%,10% and 20% are allowed respectively in their salaries then what will be the new ratio of their salaries?

- a)3:5:7 b)10:11:20 c)23:33:60 d)69:110:168 e)None

23. $A/2=B/3=C/5$ then find $A:B:C$?

- a)2:3:5 b)5:4:3 c)3:4:5 d)4:5:3 e)None

24. A,B and C entered into a partnership. A contributes Rs.3600 for 4 months, B contributes Rs.1800 for 3 months. C contributes Rs.2700 for 5 months. Find the ratio of their profits share.

- a) 16:6:15 b) 36:18:19 c) 3:1:2 d) 5:2:3 e) None

25. If the capitals of P & Q are in the ratio of 7:9 and the times of their investments are in the ratio 81:49. Then find their Profits Ratio?

- a) 4:9 b) 7:9 c) 9:7 d) 5:9 e) None

26. A, B and C together started a business and their capitals are in the ratio 5:3:2 the timing of their investments being in the ratio 4:5:6. In what ratio would their profits be distributed?

- a) 20:15:12 b) 12:13:15 c) 14:15:16 d) 12:5:5 e) None

27. In a business A, B and C invested Rs.8000, Rs.5000 & Rs.12000 respectively find the share of B in the total profit of 62500/-

- a) Rs.12600 b) Rs. 12800 c) Rs. 12500 d) Rs. 12400 e) None

28. The difference between the ages of Rajesh and Vinod is 9yrs and they are in the ratio 2:3 then the ratio of their ages after 2 yrs is..

- a)10:11 b)10:19 c)20:11 d)20:29 e)None

29. The ratio of the present ages of Father and His son is 4:3. Six years hence it will be 7:6. What is the present age of the son?

- a)7yrs b)5yrs c)10yrs d)9yrs e)None

30. Before 6yrs, the ratio of ages of A & B was 4:5 and present their ages ratio is 6:7. What is the present age of A.?

- a)6yrs b)17yrs c)7yrs d)5yrs e)None

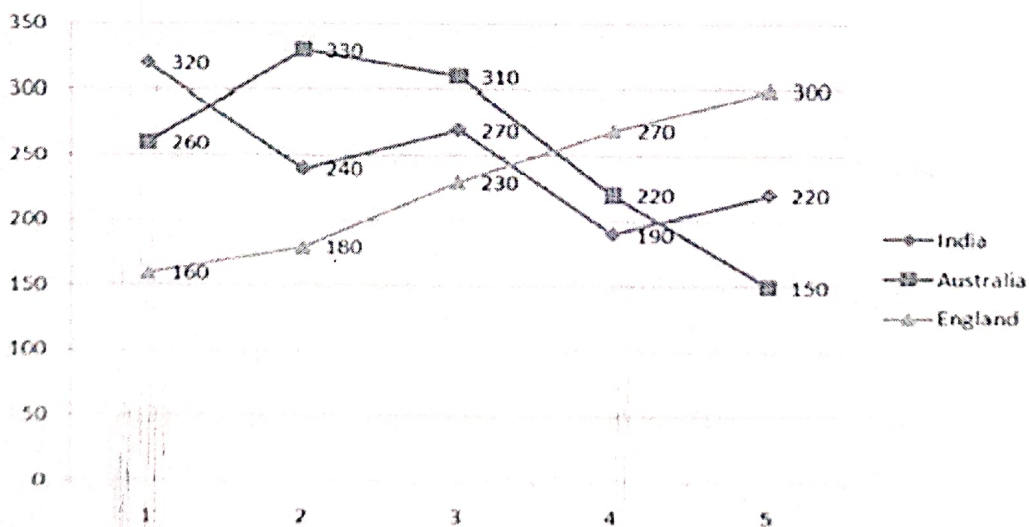
31. The ratio between the present ages of Ramesh and Jayesh is 3:2. 4yrs ago Ramesh's age was 12yrs more than by Jayesh. What is the present age of Ramesh..?

- a)18yrs b)36yrs c)64yrs d)9yrs e)None

Directions(Q.no-32 to 36):

Study the following graph carefully and answer the questions that follow.

Runs scored by three different teams in five different cricket matches



32. Total runs scored by India and Australia in Match 4 together is approximately, what percentage of the total runs scored by England in all five matches together?

- a) 42% b)18% c)36% d)24% e) 28%

33. In which match, is the difference between the runs scored by Australia and England second lowest?

- a) 1 b)2 c)3 d) 4 e)5

34. In which match the total runs scored by India and England is the third highest/lowest?

- a) 1 b)2 c) 3 d) 4 e) 5

35. What is the respective ratio between the runs scored by India in Match 5 Australia in Match 1 and England in Match 2 ?

- a) 11 : 13 : 7 b) 11 : 7 : 13 c) 11 : 3 : 9 d) 11 : 13 : 9 e) NONE OF THESE

36. What was the average runs scored by all the three teams in Match 3 together?

- a) 280 b) 270 c) 275 d) 285 e) NONE OF THESE

Directions (Q.No-37 to 41): Complete the Series

37. 64 125 216 343 ___

- a) 512 b) 513 c) 514 d) 625 e) None

38. 127 218 345 514 ___

- a) 729 b) 731 c) 730 d) 728 e) None

39. 9,27,31,155,161,1127 ___

- a) 1144 b) 1212 c) 1692 d) 1135 e) None

40. R U X A D ___

- a) H b) G c) X d) W e) None

41. ABCDEABCDABCA___

- a) B b) C c) D d) A e) None

Directions (Q.No:42 to 47): Analyze the elements

42. 342:24::543:___

- a) 12 b) 16 c) 60 d) 30 e) None

43. 9:18::6:___

- a) 24 b) 12 c) 18 d) 21 e) None

44. EIGHTY:GIEYTH::OUTPUT:

- a) TUOTUP b) OUTTUP c) TUOPUT d) PUTTUO e) None

45. A2C:D5F::G8H:___

- a) J 11 L b) I 11 K c) I 10 K d) I 12 M e) None

46. Girl: Beautiful::Boy:___

- a) Smart b) Heroic c) Courageous d) Handsome e) None

47. Train: Trail::Grain:___

- a) Grial b) Grail c) Gairl d) Giarl e) None

Directions(Q.No-48 to 52): Find the odd thing in

48. a)127 b)53 c)63 d)111 e)89
49. a)8 b)12 c)15 d)20 e)24
50. a)A 4 C b)D 10 F c)I 20 K d)G 16 I e)W 25 Y
51. a)47 B144 C)169 d)49 e)64
52. a)51 b)85 c)119 d)102 e)76

53. What % is equivalent to $\frac{3}{4}$?

- (a)50% (b)60% (c)75 % (d)16.66% (e) None of these.

54. What fraction equivalent to 325%?

- (a) $\frac{19}{4}$ (b) $\frac{13}{4}$ (c) $\frac{7}{4}$ (d) $\frac{9}{4}$ (e) None of these.

55. 40% of a number is added to 42.The resultant is that number.Find the number?

- (a) 150 (b) 200 (c) 100 (d) 300 (e) None of these.

56. The population of village is decreased from 4000 to 3500. Find the decreased percentage?

- (a) 25%(b) 22.5% (c) 12.5% (d) 14.5% (e) None of these

57. The ratio between the cost price and selling price is 9:11. Find the profit percentage?

- a)25% b)22.33% c)22.11% d)22.22% e)None

58. A dishonest dealer sold his goods at cost price but he uses 2 kg instead of 3kg. Then what is the profit percentage?

- a)50% b)25% c)12% d)33.33% e)None

59. Rajesh sold a TV set for Rs.2500 at 25% profit then what is cost price of the TV set?

- a)Rs.1000 b)Rs.2750 c)Rs.2220 d)Rs.2400 e)None

60. Arun sold an article for Rs.3200 at a loss of 20% find the cost price?

- a)Rs.2000 b)Rs.1800 c)Rs.3200 d)Rs.4000 e)None

61. Pointing a photograph of Arshita, Rajesh said, "Her father is the only son of my father." How is Arshita related to Rajesh?

- a)mother b)sister c)niece d)daughter e)none

62. A and B are children of C. C is the father of A but B is not the son of C. how is A related to C?

- a)daughter b)cousin c)son d)nephew e)none

63. What is my mother's husband's father-in-law's son's daughter to me ?

- a)brother b)bother-in-law c)uncle d)cousin e)None of these

64. April 16th 2019 was tuesday. What day of the week will it be on january 26th 2020.

- (a)Wednesday (b)Tuesday (c)sunday (d)Saturday (e)None of these.

65. Express 150mps in kmph.?

- a)250kmph b)590kmph c)580kmph d)540kmph e)None

66. The speed of a car is 30kmph after completion every one hour the speed of the car is increased by 2kmph. How much distance travelled by the car in 10hrs?

- a)390km b)200km c)210km d)305km e)None

67. Ram goes to city B from city A at 80kmph and returns to A from B at 30kmph. What is the average speed of the whole journey?

- a)48kmph b)60kmph c)65kmph d)35kmph e)None

68. What is the mirror image of 12:30 AM

- a)11:30am b)11:30pm c)12:30pm d)10:30pm e)None

69. A person borrow Rs.10000 at 30% per annum after 2 years how much interest will he pay (if compound interest is calculated annually)

- a) Rs.6500 b) Rs.6900 c) Rs.6000 d) Rs.7900 e) None of these

70. A lent Rs.1,20,000 to B. After 5yrs A received Rs.36,000 as interest. Find the rate of interest per annum (if simple interest is calculated annually)

- a)42% b)14% c)4% d)8% e)6%

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(An Autonomous College in the jurisdiction of Krishna University, Machilipatnam)
NAAC reaccredited at 'A' level and ISO 9001 – 2015 Certified
Department of Mathematics

Course Code: **MATSET03**

Offered to: B.Sc(MPC, MPCs, MSCS, MCCs)

Domain Subject: **MATHEMATICS**

Semester – **V/VI**

Max. Marks: **100** (CCIA: 25+ SEE: 75)

Theory Hrs./Week: **6**

Course 6B: MULTIPLE INTEGRALS AND APPLICATIONS OF VECTOR CALCULUS

Type of the Course: (Skill Enhancement Course (Elective)),

Credits: 05

I. Course Outcomes: Students at the successful completion of the course will be able to:

CO1: Students learn about Multiple Integrals, Change of Order of Integration in Double Integral, Area and Volume by Double Integration. Triple Integrals.

CO2: To set up and evaluate multiple integrals for regions in the plane. To find Area of the region bounded by curves and to find volume, surface area, Mass, C.G and M.I of solid geometric figures.

CO3: Recognize vector fields and vector calculus, and define Gradient, Divergence and Curl operators.

CO4: Compute the derivatives and line integrals, surface integrals and volume integrals of vector functions and learn their applications.

CO5: Students learn green's theorem, Gauss Divergence theorem, Stoke's theorem and applications to evaluating line integrals and finding areas.

II. Syllabus:

(Total Theory Hours: 75)

UNIT-I: MULTIPLE INTEGRALS – I

(15 Periods)

1.1 Introduction, Double integrals, Evaluation of double integrals, Properties of double integrals.

1.2 Region of integration, double integration in Polar Co-ordinates,

1.3 Change of variables in double integrals, change of order of integration.

UNIT-II: MULTIPLE INTEGRALS – II

(15 Periods)

2.1 Triple integral, region of integration, change of variables.

2.2 Plane areas by double integrals, surface area by double integral.

2.3 Volume as a double integral, volume as a triple integral.

UNIT-III: VECTOR DIFFERENTIATION

(15 Periods)

3.1 Vector differentiation, ordinary derivatives of vectors.

3.2 Differentiability, Gradient, Divergence, Curl operators,

3.3 Formulae involving these operators.

UNIT-IV: VECTOR INTEGRATION

(15 Periods)

- 4.1 Line Integrals with examples.
- 4.2 Surface Integral with examples.
- 4.3 Volume integral with examples.

UNIT-V: VECTOR INTEGRATION APPLICATIONS

(15 Periods)

- 5.1 Gauss theorem and applications of Gauss theorem.
- 5.2 Green's theorem in plane and applications of Green's theorem.
- 5.3 Stokes's theorem and applications of Stokes theorem.

III References/ Text Book/ e-books/websites

1. Dr.M Anitha, Linear Algebra and Vector Calculus for Engineer, Spectrum University Press, SR Nagar, Hyderabad-500038, INDIA.
2. Dr.M.BabuPrasad,Dr.K.KrishnaRao,D.Srinivasulu,Y.AdiNarayana,EngineeringMathematics-II,SpectrumUniversityPress,SRNagar, Hyderabad-500038,INDIA.
3. V.Venkateswararao, N.Krishnamurthy, B.V.S.S.Sarma and S.AnjaneyaSastry, A text Book of B.Sc. Mathematics Volume III B.Sc. Chand&Company, Pvt.Ltd., RamNagar, NewDelhi-110055.
4. R.Gupta, Vector Calculus, Laxmi Publications.
5. P.C.Matthews, Vector Calculus, Springer Verlag publications.
6. Web resources suggested by the teacher and college librarian including reading material.

Reference Materials on the Web/web-links:

https://mate.unipv.it/moiola/ReaDG/VC2016/VectorCalculus_LectureNotes_2016.pdf

IV Co-Curricular Activities:

A)Mandatory:

For Teacher: Teacher shall train students in the following skills for 15 hours, by taking Relevant outside data (Field/Web).

1. The methods of evaluating double integrals and triple integrals in the class room and train to evaluate these integrals of different functions over different regions.
2. Applications of line integral, surface integral and volume integral.
3. Applications of Gauss divergence theorem, Green's theorem and Stokes's theorem.

For Student: Project work Each student individually shall undertake Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following, by choosing any one of the following aspects.

1. Going through the web sources like Open Educational Resources to find the values of double and triple integrals of specific functions in a given region and make conclusions.(or)
2. Going through the web sources like Open Educational Resources to evaluate line integral, surface integral and volume integral and apply Gauss divergence theorem, Green's theorem and Stokes theorem and make conclusions.

Max.MarksforProjectworkReport:10.

Suggested Format for Project work Report:

Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and Acknowledgements.

Comprehensive Continuous Assessment Test (CCIA):

(2 tests will be conducted each carries 15 Marks, consider Average Mark: 15)

B) Suggested Co-Curricular Activities:

1. Assignments, Seminar, Quiz, Group discussions/Debates.
2. Visits to research organizations, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified area.

SECTION – A

Answer any FIVE of the following.

5 x 5 = 25 M

1. Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dx dy$ (C01, L1)
2. Evaluate $\int_0^e \int_1^{\log y} \int_1^{e^x} \log z dz dx dy$ (C02, L1)
3. 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). (C03, L2)
4. Find the angle between the surfaces $\phi_1 : x^2 + y^2 + z^2 = 29$, $\phi_2 : x^2 + y^2 + z^2 + 4x - 6y - 8z - 47 = 0$ at the point (4, -3, 2). (C04, L3)
5. Evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = x^2 y^2 \vec{i} + y \vec{j}$ and the curve C is $y^2 = 4x$ in the xy plane from (0,0) to (4,4). (C04, L3)
6. Evaluate $\int_S \vec{F} \cdot N ds$, where $\vec{F} = z\vec{i} + x\vec{j} - 3y^2 z\vec{k}$ and S is the surface $x^2 + y^2 = 16$ included in the first octant between Z=0 and Z=5. (C04, L3)
7. Evaluate by stoke's theorem, $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = yz\vec{i} + zx\vec{j} + xy\vec{k}$ and C is the curve $x^2 + y^2 = 1, z = y^2$. (C05, L4)
8. By Using Green's Theorem, evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = (x^2 + y^2)\vec{i} - 2xy\vec{j}$ and C is rectangle in xy plane bounded by x=0, y=0, x=a, y=a. (C05, L4)

SECTION – B

Answer ALL the questions.

5 x 10 = 50 M

9. a) Change the order of integration and evaluate $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dy dx$ (C01, L1)
(OR)
- b) Sketch the region of integration of $\int_a^{ae^{\pi/4}} \int_{2\log(r/a)}^{\pi/2} f(r, \theta) r dr d\theta$ and change the order of integration. (C01, L1)
10. a) Evaluate the triple integral $\iiint xy^2 z dx dy dz$ taken through the positive octant of the Sphere $x^2 + y^2 + z^2 = a^2$ (C02, L2)
(OR)
- b) Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dx dy dz$ (C02, L1)

11. a) Prove that $\text{grad}(\vec{A} \cdot \vec{B}) = (\vec{B} \cdot \nabla) \vec{A} + (\vec{A} \cdot \nabla) \vec{B} + (\vec{B} \times \text{curl} \vec{A}) + (\vec{A} \times \text{curl} \vec{B})$
(C03, L2)

(OR)

b) If \vec{a} is a constant vector, then prove that $\text{curl} \left(\frac{\vec{a} \times \vec{r}}{r^3} \right) = \frac{-\vec{a}}{r^3} + \frac{3\vec{r}}{r^5} (\vec{a} \cdot \vec{r})$

(C03, L2)

12. a) If $\vec{F} = 4xz \vec{i} - y^2 \vec{j} + yz \vec{k}$ then evaluate $\iiint_V \phi \, dv$ where V is the volume enclosed by the closed region bounded by the planes $4x + 2y + z = 8$, $x = 0$, $y = 0$, $z = 0$

(C04, L3)

(OR)

b) If $\phi = 45x^2y$ then evaluate $\int_S (\vec{F} \cdot \vec{N}) \, ds$ where S is the surface of the cube bounded by $x=0$, $x=a$, $y=0$, $y=a$, $z=0$, $z=a$.

(C04, L3)

13. a) State and Prove Gauss Divergence Theorem.

(C05, L4)

(OR)

b) Verify Green's Theorem in the plane for $\oint (3x^2 - 8y^2) dx + (4y - 6xy) dy$, where C is the region bounded by $y = \sqrt{x}$ and $y = x^2$

(C05, L4)

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Department of Mathematics

Course Code: **MATSET04**

Offered to: B.Sc (MPC, MPCs, MCCs, MSCS,)

Domain Subject: **MATHEMATICS**

Semester – **V/VI**

Max. Marks: **100** (CCIA: 25+ SEE: 75)

Theory Hrs./Week: **6**

Course 7B: INTEGRAL TRANSFORMS WITH APPLICATIONS

Type of the Course: (**Skill Enhancement Course** (Elective)),

Credits: **05**

I. Course Outcomes: Students at the successful completion of the course will be able to:

CO1: Evaluate Laplace transforms of certain functions, find Laplace transforms of Derivatives and integrals.

CO2: Determine properties of Laplace transform which may be solved by application of Special functions namely Dirac delta function, error function, Bessel function and Periodic function.

CO3: Understand properties of inverse Laplace transforms, find inverse Laplace Transforms of derivatives and of integrals.

CO4: Solve ordinary differential equations with constant/ variable coefficients by using Laplace transforms method.

CO5: Comprehend the properties of Fourier transforms and solve problems related to finite Fourier transforms.

II. Syllabus:

(Total Theory Hours: 75)

UNIT-I: LAPLACE TRANSFORMS – I

(15 Periods)

1.4 Definition of Laplace transform, linearity property-piece wise continuous function.

1.5 Existence of Laplace transform, functions of exponential order and of class A.

1.6 First shifting theorem, second shifting theorem and change of scale property.

UNIT-II: LAPLACE TRANSFORMS – II

(15 Periods)

2.2 Laplace Transform of the derivatives, initial value theorem and final value theorem. Laplace transforms of integrals.

2.3 Laplace transform of $t^n \cdot f(t)$, division by t , evolution of integrals by Laplace transforms.

2.3 Laplace transform of some special functions-namely Dirac delta function, error function, Bessel function and Laplace transform of periodic function.

UNIT-III: INVERSE LAPLACE TRANSFORMS

(15 Periods)

3.1 Definition of Inverse Laplace transforms, linear property, first shifting theorem, second shifting theorem, change of scale property, use of partial fractions.

3.2 Inverse Laplace transforms of derivatives, inverse, Laplace transforms of integrals, multiplication by powers of 'p', division by 'p'.

3.3 Convolution, convolution theorem proof and applications.

UNIT-IV: FOURIER SERIES

(15 Periods)

4.1 Introduction, Euler's formulae for Fourier series expansion of a function $f(x)$, Dirichlet's conditions for Fourier series, convergence of Fourier series.

4.2 Functions having arbitrary periods. Change of interval, half range series.

4.3 Parseval's theorem, illustrative examples based on Parseval's theorem, some Particular series.

UNIT-V: FOURIER TRANSFORMS

(15 Periods)

5.1 Integral transforms, Fourier integral theorem (without proof), Fourier sine and Cosine integrals.

5.2 Properties of Fourier transforms, change of scale property, shifting property, Modulation theorem.

5.3 Convolution, Convolution theorem for Fourier transforms, Parseval's Identify, finite Fourier transforms.

III References/ Text Book/ e-books/websites

1. Dr.S.Sreenadh, S.Ranganatham, Dr.M.V.S.S.N.Prasad, Dr.V.Ramesh Babu, Fourier series and Integral Transforms, S.Chand & Company, Pvt. Ltd.,RamNagar,NewDelhi-110055.
2. A.R.Vasistha,Dr.R.K.Gupta,LaplaceTransforms,KrishnaPrakashanMediaPvt.Ltd.Me erut.
3. M.D.Raisinghania, H.C. Saxena , H.K. Dass, Integral Transforms, S. Chand & CompanyPvt.Ltd., Ram Nagar, New Delhi-110055.
4. Dr.J.K.Goyal,K.P.Gupta, Laplace andFourierTransforms,PragathiPrakashan, Meerut.
5. Shanthi Narayana , P.K. Mittal, A Course of Mathematical Analysis, S. Chand & Company Pvt. Ltd.Ram Nagar, New Delhi-110055.
6. Web resources suggested by the teacher and college librarian including reading material.

Reference Materials on the Web/web-links:

1. <http://aurora.phys.utk.edu/~forrest/papers/fourier/index.html> An introduction to the Fourier Transform, Fast Fourier Transform, and Discrete Fourier Transform.
2. <http://rise1.numis.nwu.edu/ffl/> Public Domain code related to Fast Fourier Transforms.

IV)Co-Curricular Activities:

A) Mandatory:

For Teacher: Teacher shall train students in the following skills for 15 hours, by taking Relevant outside data (Web).

1. Demonstrate on sufficient conditions for the existence of the Laplace transform of a function.

2. Evaluation of Laplace transforms and methods of finding Laplace transforms.
3. Evaluations of Inverse Laplace transforms and methods of finding Inverse Laplace transforms.
4. Fourier transforms and solutions of integral equations.

For Student: Project work: Each student individually shall undertake Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following, by choosing any one of the aspects.

1. Going through the web sources like Open Educational Resources on Applications of Laplace transforms and Inverse Laplace transforms to find solutions of ordinary differential equations with constant/variable coefficients and make conclusions. (or)
2. Going through the web sources like Open Educational Resources on Applications of convolution theorem to solve integral equations and make conclusions. (or)
3. Going through the web source like Open Educational Resources on Applications of Fourier transforms to solve integral equations and make conclusions.

Max. Marks for Project work Report: 10.

Suggested Format for Fieldwork/Project work Report: Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and Acknowledgements.

Comprehensive Continuous Assessment Test (CCIA):

(2 tests will be conducted each carries 15 Marks, consider Average Mark: 15)

A) Suggested Co-Curricular Activities:

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates
2. Visits to research organizations, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified area.

Course Code: MATSET04

MAX MARKS: 75

Time: 3Hrs

Offered to: B.Sc (MPC, MPCS, MCCs, MSCs)

Title of the Course: INTEGRAL TRANSFORMS WITH APPLICATIONS

SECTION - A

Answer any FIVE of the following.

5 x 5 = 25 M

1. Show that $L(\sinh at \sin at) = \frac{2a^2 p}{p^4 + 4a^4}$ (CO1,L1)
2. If $L[F(t)] = \frac{p^2 - p + 1}{(2p+1)^2(p-1)}$ then show that $L\{F(2t)\} = \frac{p^2 - 2p + 4}{4(p+1)^2(p-2)}$ by applying change of scale property (CO1,L1)
3. Find $L\left\{\int_0^t \frac{e^t \sin t}{t} dt\right\}$ (CO2,L2)
4. Find $L^{-1}\left\{\frac{5}{p^2} + \left(\frac{\sqrt{p-1}}{p}\right)^2 - \frac{7}{3p+2}\right\}$ (CO3,L2)
5. Find a_0, a_n for a Fourier Series to represent $f(x) = x^2$ in the interval $(0, 2\pi)$ (CO4, L3)
6. Find the half range sine series of $f(x) = 1$ in $[0, l]$ (CO4, L3)
7. State and Prove Linear Property of Fourier Transform. (CO5, L3)
8. Find the Fourier Sine transform of $2e^{-5x} + 5e^{-2x}$ (CO5, L4)

SECTION - B

Answer ALL the questions.

5 x 10 = 50 M

9. a) State and Prove Second Shifting Theorem. (CO1, L2)
(OR)
- b) If $L\{F(t)\} = f(p)$ then $L\{t^n F(t)\} = (-1)^n \frac{d^n}{dp^n}[f(p)], n = 1, 2, 3, \dots$ (CO1, L2)
10. a) State and Prove Initial Value theorem. (CO2, L3)
(OR)
- b) Using Laplace transform, evaluate $\int_0^\infty \frac{\cos at - \cos bt}{t} dt$ (CO2, L3)
11. a) Find the inverse Laplace Transforms of $\left[\frac{4p+5}{(p-1)^2(p+2)}\right]$ (CO3, L4)
(OR)
- b) State and Prove Convolution Theorem. (CO3, L3)
12. a) Find the Fourier series to represent $f(x) = x^2 - 2$, when $-2 \leq x \leq 2$ (CO4, L3)
(OR)
- b) Find the Fourier series of $f(x) = \frac{\pi-x}{2}$ in $0 < x < 2$. (CO4, L3)

13. a) Find the Fourier transform of $f(x) = \begin{cases} 1, & \text{if } |x| < a \\ 0, & \text{if } |x| > a \end{cases}$ hence evaluate

$$\int_0^{\infty} \frac{\sin p}{p} dp \quad \text{and} \quad \int_{-\infty}^{\infty} \frac{\sin ap \cos px}{p} dp \quad (\text{CO5, L4})$$

(OR)

- c) Find the Fourier sine and cosine transforms of $f(x) = \frac{e^{-ax}}{x}$ and deduce that

$$\int \frac{e^{-ax} - e^{-bx}}{x} \sin sx \, dx = \tan^{-1} \left(\frac{s}{a} \right) - \tan^{-1} (b) \quad (\text{CO5, L4})$$

B.Sc (Honours) with Single Major																											
Semester	Major* (4 Cr)			Minor (4 Cr)			AECC (3 Cr)			Multi Disney' (2 Cr)			Skill Enhancement Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Micro-Credentials			Total		
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr
Sem 1	2*	10	8				2	8	6	1	2	2	2	6	4										7	26	20
Sem 2	2	6+4	8	1	3+2	4	2	8	6				2	6	4										7	29	22
Community Service Project of 180 hours with 4 Credits. Student is eligible for Exit Option-1 with the award of Certificate in respective discipline																											
Sem 3	4	12-8	16	1	3-2	4				1	2	2	1	2	2										7	29	24
Sem 4	3	9-6	12	2	6-4	8				1	2	2	1	2	2										7	29	24
Short-Term Internship/Apprenticeship/OJT of 180 hours with 4 Credits. Student is eligible for Exit Option-2 with the award of Diploma in respective major with minor																											
Sem 5	4	12-8	16	2	6-4	8													1	2	2				7	32	26
Semester Internship/Apprenticeship/OJT with 12 Credits. Student is eligible for Exit Option-3 with the award of Degree in respective major with minor																											
Sem 6																											
Sem 7	3	9+6	12										2*	6+4	8	1	2	2	1	2	0				6	29	22
Sem 8	3	9-6	12										2*	6+4	8	1	2	2	1	2	0				6	29	22
	21		84	6		24	4		12	3	6	6	10	32	28	2	4	4	2	4	0				47		160

20 Additional Credits for 10 month mandatory Internship/OJT/Apprenticeship

C Courses

H Hours

Cr Credits

OOTC Open Online Transdisciplinary

IKS Indian Knowledge Systems

B.Com/BBA (Honours) with Minor																														
Semester	Major* (4 Cr)			Minor (4 Cr)			Languages (3 Cr)			Multi Disney' (2 Cr)			Skill Enhancement Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Micro-Credentials			Total					
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr			
Sem 1*	2	8	8				2	8	6	1	2	2	2	6	4													7	24	20
Sem 2	2	8	8	1	4	4	2	8	6				2	6	4													7	26	22
Community Service Project of 180 hours with 4 Credits.																														
Sem 3	4	16	16	1	4	4				1	2	2	1	2	2													7	24	24
Sem 4	3	12	12	2	8	8				1	2	2	1	2	2													7	24	24
Short-Term Internship/Apprenticeship/OJT of 180 hours with 4 Credits.																														
Sem 5	4	16	16	2	8	8													1	2	2							7	26	26
Sem 6	Semester Internship/Apprenticeship/OJT with 12 Credits.																													
Sem 7	3	12	12										2*	8	8	1	2	2	1	2	0							6	24	22
Sem 8	3	12	12										2*	8	8	1	2	2	1	2	0							6	24	22
	21		84	6		24	4		12	3	6	6	10	32	28	2	4	4	2	4	0							47		160

20 Additional Credits for 10 month mandatory Internship/OJT/Apprenticeship

C Courses

H Hours

Cr Credits

OOTC Open Online Transdisciplinary

IKS Indian Knowledge Systems

B.A. (Honours) with Single Major																														
Semester	Major* (4 Cr)			Minor (4 Cr)			Languages (3 Cr)			Multi Disny' (2 Cr)			Skill Enhancement Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Micro- Credenti als			Total					
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr			
Sem 1*	2	8	8				2	8	6	1	2	2	2	6	4													7	24	20
Sem 2	2	8	8	1	4	4	2	8	6				2	6	4													7	26	22
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Sem 4	3	12	12	2	8	8				1	2	2	1	2	2													7	24	24
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																			IKS											
Sem 7	3	12	12										2*	8	8	1	2	2	1	2	0							6	24	22
Sem 8	3	12	12										2*	8	8	1	2	2	1	2	0							6	24	22
	21		84	6		24	4		12	3	6	6	10	32	28	2	4	4	2	4	0							47		160

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IKS Indian Knowledge Systems