Course File

On

"Laplace Transforms, Numerical Methods and Complex Variables"

(2022-2023)

(R20)

Submitted by

Mr. A. Sreehari

Assistant Professor

Mr. N. Levi Chellson

Assistant Professor

From Department of Humanities and Sciences (Mathematics)

In the department of

E.C.E

CMR ENGINEERING COLLEGE

UGC AUTONOMOUS

(Approved by AICTE - New Delhi. Affiliated to JNTUH and Accredited by NAAC & NBA)

Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

Ph: 08418 200037, 92470 22662, Fax: 08418 200240, www.cmrec.ac.in

Subject: LTNMCV

COURSE FILE

Subject: **LAPLACE TRANSFORMS, NUMERICAL METHODS AND COMPLEX VARIABLES**

Year: **II– B.Tech. II SEM** Branch: **ECE**

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DEPARTMENT VISION & MISSION:

VISION OF THE INSTITUTE:

To be recognized as a premier institution in offering value based and futuristic quality technical education to meet the technological needs of the society.

MISSION OF THE INSTITUTE:

- To impart value based quality technical education through innovative teaching and learning methods.
- To continuously produce employable technical graduates with advanced skills to meet the current and future technological needs of the society.
- To prepare the graduates for higher learning with emphasis on academic and industrial research.

1. DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To promote excellence in technical education and scientific research in Electronics and Communication engineering for the benefit of society.

MISSION

- To impart excellent technical education with state of art facilities inculcating values and lifelong learning attitude.
- To develop core competence in our students imbibing professional ethics and team spirit.
- To encourage research benefiting society through higher learning.

2. LIST OF PEOs, POs & PSOs

PROGRAMMES EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1: Excel in professional career & higher education in Electronics & Communication Engineering and allied fields through rigorous quality education.
- PEO 2: Exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in lifelong learning.
- PEO 3: Solve real life problems relating to Electronics & Communication Engineering for the benefits of society.

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, social, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

PROGRAM SPECIFIC OUTCOMES (PSOs):

1. Ability to apply concepts of Electronics & Communication Engineering to associated research areas of electronics, communication, signal processing, VLSI & Embedded systems.
2. Ability to design, analyze and simulate a variety of Electronics & Communication functional elements using hardware and software tools along with analytic skills.

3. MAPPING OF COs WITH POS AND PSOs:

COURSE OUTCOMES:

CO1	**Use** the Laplace transforms techniques forsolving ODE's.
CO2	**Find** the root of a given equation. **Estimate** the value for the given data using Interpolation.
CO3	**Find** the numerical solutions for givenODE's.
CO4	**Analyze** the complex function with reference to their analyticity, integration using Cauchy's Integral and Residue theorems.
CO5	**Examine** the Taylor's and Laurent's series expansions ofcomplex functions.

Course Code.CO No	**Course Outcomes (CO's)**
At the end of the course student will be able to	
CMA401BS.1	Use the Laplace transforms techniques for solving ODE's
CMA401BS.2	Find the root of a given equation
CMA401BS.3	Estimate the value for the given data using interpolation
CMA401BS.4	Find the numerical solutions for a given ODE's
CMA401BS.5	Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorem

Course Outcome (CO)-Program Outcome (PO) Matrix:

Course Outcomes (CO's)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CMA401BS.1	3	2	-	-	-	-	-	-	-	-	-	-
CMA401BS.2	3	2	-	-	-	-	-	-	-	-	-	-
CMA401BS.3	3	2	-	-	-	-	-	-	-	-	-	-
CMA401BS.4	3	2	-	-	-	-	-	-	-	-	-	-
CMA401BS.6	3	2	-	-	-	-	-	-	-	-	-	-

Course Outcome (CO)-Program Specific Outcome (PSO) Matrix:

Course Outcomes (CO's)	PSO1	PSO2
CMA401BS.1	3	2
CMA401BS.2	3	2
CMA401BS.3	3	2
CMA401BS.4	3	2
CMA401BS.5	3	2

4. SYLLABUS COPY - (R20):

UNIT - I

Laplace Transforms **14 L**

Laplace Transforms; Laplace Transform of standard functions; first shifting theorem; Laplace transforms of functions when they are multiplied and divided by't'. Laplace transforms of derivatives and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of Special functions; Laplace transform of periodic functions.

Inverse Laplace transform by different methods, convolution theorem (without Proof), solving ODEs by Laplace Transform method.

UNIT - II

Numerical Methods – I **8 L**

Solution of polynomial and transcendental equations – Bisection method, Iteration Method, Newton- Raphson method and Regula-Falsi method.

Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation.

UNIT - III

Numerical Methods – II **5 L**

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods;Runge-Kutta method of fourth order .

UNIT - IV

Complex Variables (Differentiation) **16 L**

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT – V

Complex Variables (Integration) **15 L**

Line integrals, Cauchy's theorem, Cauchy's Integral formula, Liouville's theorem, Maximum-Modulus theorem (All theorems without proof); zeros of analytic functions, singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of Numerical analysis, PHI, 4th Edition, 2005.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill,2004.

REFERENCE BOOKS:

1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and EngineeringComputations , New Age International publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

5. INDIVIDUAL TIME TABLE:

SUBJECT:LTNMCV **SECTION:III- C&II-A,C** **NAME: Dr.Y.Sunitha Rani**

Day & Time	I	II	III	IV		V	VI	VII
	09.10 – 10.10	10.10- 11.00	11.00 – 11.50	11.50 – 12.40	12.40 - 01.20	01.20 – 02.20	02.20 – 03.10	03.10 – 04.00
MON				LTNMCV				
TUE	LTNMCV					LTNMCV		
WED								
THU						LTNMCV		
FRI				LTNMCV				
SAT						LTNMCV		

6. SESSION PLAN/LESSON PLAN:

SUBJECT-LESSON PLAN

Subject code	Name of the subject	Year/Branch	Name of the Faculty
MA301BS	LAPLACE TRANSFORMS, NUMERICAL METHODS AND COMPLEX VARIABLES	II B.TECH II SEM ECE	1) Mr. A. Sreehari 2) Mr. N. Levi Chellson

S.NO	Topic (UGC Autonomous Syllabus)	Sub-Topic	No. of Lectures Required	Suggested Books	Remarks
UNIT – I Laplace Transforms	Laplace Transforms	Basic concepts, Laplace Transforms formulae and Exponential order	L1	T1, R2	
	Laplace Transform of standard functions	Laplace Transform of standard Functions	L2	T1, R2	
	First shifting theorem	First shifting theorem	L3, L4, L5	T1, R2	

	Laplace transforms of functions when they are multiplied by 't'	Laplace transforms of functions when they are multiplied by 't'	L6	T1, R2	
	Laplace transforms of functions when they are divided by 't'	Laplace transforms of functions when they are divided by 't'	L7	T1, R2	
	Laplace transforms of derivatives	Laplace transforms of derivatives	L8	T1, R2	
	Laplace transforms of integrals	Laplace transforms of integrals	L9	T1, R2	
	Evaluation of integrals by Laplace transforms	Evaluation of integrals by Laplace transforms	L10	T1, R2	
	Laplace transforms of Special functions	Laplace transforms of Special functions	L11	T1, R2	
	Laplace transform of periodic functions.	Laplace transform of periodic functions.	L12	T1, R2	
	Inverse Laplace transform by different methods, convolution theorem (without Proof)	Inverse Laplace transform by different methods, convolution theorem (without Proof)	L13	T1, R2	
	Solving ODEs by Laplace Transform method.	Solving ODEs by Laplace Transform method.	L14	T1, R2	
	TOTAL NO OF CLASSES 14				
UNIT – II Numerical Methods – I	Solution of polynomial and transcendental equations– Bisection method, Iteration Method.	Solution of polynomial and transcendental equations– Bisection method, Iteration Method.	L15,16	T2, R1	
	Newton- Raphson method and Regula-Falsi method.	Newton- Raphson method and Regula-Falsi method.	L17	T2, R1	
	Finite differences- forward differences- backward differences-central differences.	Finite differences- forward differences- backward differences-central differences.	L18	T2, R1	
	Symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference	Symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference	L19	T2, R1	

	formulae.	formulae.			
	Central difference interpolation: Gauss's forward and backward formulae.	Central difference interpolation: Gauss's forward and backward formulae.	L20	T2, R1	
	Lagrange's method of interpolation	Lagrange's method of interpolation	L21,22	T2, R1	
	TOTAL NO OF CLASSES 8				
UNIT – III Numerical Methods – II	Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	L23	T2, R1	
	Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods;	Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods;	L24,25	T2, R1	
	Runge-Kutta method of fourth order.	Runge-Kutta method of fourth order.	L26,27	T2, R1	
	TOTAL NO OF CLASSES 5				
UNIT – IV Complex Variables (Differentiation)	Limit, Continuity and Differentiation of Complex functions.	Limit, Continuity and Differentiation of Complex functions.	L28,29	T1, T3, R2	
	Cauchy-Riemann equations (without proof).	Cauchy-Riemann equations (without proof).	L30	T1, T3, R2	
	Milne- Thomson methods.	Milne- Thomson methods.	L31,32	T1, T3, R2	
	Analytic functions	Analytic functions	L33	T1, T3, R2	
	Harmonic functions	Harmonic functions	L34	T1, T3, R2	
	Finding harmonic conjugate	Finding harmonic conjugate	L35	T1, T3, R2	
	Finding harmonic conjugate	Finding harmonic conjugate	L36	T1, T3, R2	
	Elementary analytic functions	Elementary analytic functions	L37	T1, T3, R2	
	Elementary analytic functions	Elementary analytic functions	L38,39	T1, T3, R2	

	Elementary analytic functions	Elementary analytic functions	L40	T1, T3, R2	
	(exponential, trigonometric, logarithm) and their properties.	(exponential, trigonometric, logarithm) and their properties.	L41	T1, T3, R2	
	(exponential, trigonometric, logarithm) and their properties.	(exponential, trigonometric, logarithm) and their properties.	L42	T1, T3, R2	
	(exponential, trigonometric, logarithm) and their properties.	(exponential, trigonometric, logarithm) and their properties.	L43	T1, T3, R2	
TOTAL NO OF CLASSES 16					
UNIT – V Complex Variables (Integration)	Line integrals	Line integrals	L44	T1, T3, R2	
	Line integrals	Line integrals	L45	T1, T3, R2	
	Cauchy's theorem	Cauchy's theorem	L46	T1, T3, R2	
	Cauchy's Integral formula	Cauchy's Integral formula	L47	T1, T3, R2	
	Liouville's theorem	Liouville's theorem	L48	T1, T3, R2	
	Maximum-Modulus theorem	Maximum-Modulus theorem	L49	T1, T3, R2	
	zeros of analytic functions	zeros of analytic functions	L50	T1, T3, R2	
	singularities	singularities	L51	T1, T3, R2	
	singularities	singularities	L52	T1, T3, R2	
	Taylor's series	Taylor's series	L53	T1, T3, R2	
	Taylor's series	Taylor's series	L54	T1, T3, R2	
	Laurent's series	Laurent's series	L55	T1, T3, R2	
	Laurent's series	Laurent's series	L56	T1, T3, R2	
	Residues	Residues	L57	T1, T3, R2	
	Cauchy Residue theorem (without proof)	Cauchy Residue theorem (without proof)	L58	T1, T3, R2	
TOTAL NO OF CLASSES 15					
TOTAL NO OF CLASSES 58					

7. DETAILED LECTURE PLAN:

S.NO	Topic (UGC Autonomous Syllabus)	Sub-Topic	No. of Lectures Required	Course Outcome	Method of Teaching
UNIT – I Laplace Transforms	Laplace Transforms	Basic concepts, Laplace Transforms formulae and Exponential order	L1	CO 1	CHALK AND TALK
	Laplace Transform of standard functions	Laplace Transform of standard Functions	L2		
	First shifting theorem	First shifting theorem	L3, L4, L5		
	Laplace transforms of functions when they are multiplied by 't'	Laplace transforms of functions when they are multiplied by 't'	L6		
	Laplace transforms of functions when they are divided by 't'	Laplace transforms of functions when they are divided by 't'	L7		
	Laplace transforms of derivatives	Laplace transforms of derivatives	L8		
	Laplace transforms of integrals	Laplace transforms of integrals	L9		
	Evaluation of integrals by Laplace transforms	Evaluation of integrals by Laplace transforms	L10		
	Laplace transforms of Special functions	Laplace transforms of Special functions	L11		
	Laplace transform of periodic functions.	Laplace transform of periodic functions.	L12		
	Inverse Laplace transform by different methods, convolution theorem (without Proof)	Inverse Laplace transform by different methods, convolution theorem (without Proof)	L13		
	Solving ODEs by Laplace Transform method.	Solving ODEs by Laplace Transform method.	L14		
	TOTAL NO OF CLASSES REQUIRED 14				
UNIT – II Numerical Methods – I	Solution of polynomial and transcendental equations– Bisection method, Iteration Method.	Solution of polynomial and transcendental equations– Bisection method, Iteration Method.	L15,16		

	Newton- Raphson method and Regula-Falsi method.	Newton- Raphson method and Regula-Falsi method.	L17	CO 2	CHALK AND TALK
	Finite differences- forward differences- backward differences-central differences.	Finite differences- forward differences- backward differences-central differences.	L18		
	Symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae.	Symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae.	L19		
	Central difference interpolation: Gauss's forward and backward formulae.	Central difference interpolation: Gauss's forward and backward formulae.	L20		
	Lagrange's method of interpolation	Lagrange's method of interpolation	L21,22		
	TOTAL NO OF CLASSES REQUIRED 8				
UNIT – III Numerical Methods – II	Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	L23	CO 3	CHALK AND TALK
	Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods;	Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods;	L24,25		
	Runge-Kutta method of fourth order.	Runge-Kutta method of fourth order.	L26,27		
	TOTAL NO OF CLASSES REQUIRED 5				
UNIT – IV Complex Variables (Differentiation)	Limit, Continuity and Differentiation of Complex functions.	Limit, Continuity and Differentiation of Complex functions.	L28,29		
	Cauchy-Riemann equations (without proof).	Cauchy-Riemann equations (without proof).	L30		
	Milne- Thomson methods.	Milne- Thomson methods.	L31,32		
	Analytic functions	Analytic functions	L33		

	Harmonic functions	Harmonic functions	L34	CO 4	CHALK AND TALK
	Finding harmonic conjugate	Finding harmonic conjugate	L35		
	Finding harmonic conjugate	Finding harmonic conjugate	L36		
	Elementary analytic functions	Elementary analytic functions	L37		
	Elementary analytic functions	Elementary analytic functions	L38,39		
	Elementary analytic functions	Elementary analytic functions	L40		
	(exponential, trigonometric, logarithm) and their properties.	(exponential, trigonometric, logarithm) and their properties.	L41		
	(exponential, trigonometric, logarithm) and their properties.	(exponential, trigonometric, logarithm) and their properties.	L42		
	(exponential, trigonometric, logarithm) and their properties.	(exponential, trigonometric, logarithm) and their properties.	L43		
TOTAL NO OF CLASSES REQUIRED 16					
UNIT – V Complex Variables (Integration)	Line integrals	Line integrals	L44	CO 5	CHALK AND TALK
	Line integrals	Line integrals	L45		
	Cauchy's theorem	Cauchy's theorem	L46		
	Cauchy's Integral formula	Cauchy's Integral formula	L47		
	Liouville's theorem	Liouville's theorem	L48		
	Maximum-Modulus theorem	Maximum-Modulus theorem	L49		
	zeros of analytic functions	zeros of analytic functions	L50		
	singularities	singularities	L51		
	singularities	singularities	L52		
	Taylor's series	Taylor's series	L53		
	Taylor's series	Taylor's series	L54		

	Laurent's series	Laurent's series	L55		
	Laurent's series	Laurent's series	L56		
	Residues	Residues	L57		
	Cauchy Residue theorem (without proof)	Cauchy Residue theorem (without proof)	L58		
TOTAL NO OF CLASSES REQUIRED 15					
TOTAL NO OF CLASSES REQUIRED 58					

8. SESSION EXECUTION LOG:

Sl .no	Syllabus	Scheduled completed date	Completed date	Remarks
1	I-UNIT	7-9-2021	8-10-2021	COMPLETED
2	II-UNIT	20-10-2021	29-10-2021	COMPLETED
3	III-UNIT	30-10-2021	23-11-2021	COMPLETED
4	IV-UNIT	25-11-2021	11-12-2021	COMPLETED
5	V-UNIT	14-12-2021	18-1-2022	COMPLETED

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ACADEMIC YEAR 2022-2023

ACADEMIC SCHEDULE FOR Laplace Transforms , Numerical Methods & Complex Variables (II-BTECH I-SEM)

S.No	Day	Date	Topic	Total Classes	Remarks
1	Monday	10-Oct-22	UNIT:1 **Laplace Transform of Standard functions**	**1**	
2	Tuesday	11-Oct-22	**T&P**		

3	Wednesday	12-Oct-22	**First Shift Property, Second Shift Property**	**2**	
4	Thursday	13-Oct-22	**Change of scale property, Multiplication & Division by t**	**3**	
5	Friday	14-Oct-22	**L.T .of Derivatives & Integrals**	**4**	
6	Saturday	15-Oct-22	**L.T. of Special Functions**	**5**	
7	Sunday	16-Oct-22	SUNDAY		
8	Monday	17-Oct-22	**L.T of Periodic Functions**	**6**	
9	Tuesday	18-Oct-22	**T&P**		
10	Wednesday	19-Oct-22	**Inverse L.T of Standard Functions, First Shift Property, Second Shift Property,Change of scale property**	**7**	
11	Thursday	20-Oct-22	**Inverse L.T of Multiplication & Division by t**	**8**	
12	Friday	21-Oct-22	**Inverse L.T of Derivatives & Integrals**	**9**	
13	Saturday	22-Oct-22	**Convolution Theorem**	**10**	
14	Sunday	23-Oct-22	SUNDAY		
15	Monday	24-Oct-22	**DEWALI**		
16	Tuesday	25-Oct-22	**Integral Equations**	**11**	
17	Wednesday	26-Oct-22	**T&P**		
18	Thursday	27-Oct-22	**Solution of Ordinary D.E's with constant coefficients**	**12**	
19	Friday	28-Oct-22	**Solution of Ordinary D.E's with variable coefficients**	**13**	
20	Saturday	29-Oct-22	**Initial & Final Value Theorems**	**14**	
21	Sunday	30-Oct-22	SUNDAY		
22	Monday	31-Oct-22	**Unit :2 Numerical Methods-I**	**15**	
23	Tuesday	1-Nov-22	**T&P**		
24	Wednesday	2-Nov-22	**Solution of Algebraic & Transcendental Equations, Bisection Method, Regula Falsi Method**	**16**	
25	Thursday	3-Nov-22	**Iteration Method , Newton Raphson Method**	**17**	
26	Friday	4-Nov-22	**Symbolic operators & Separation of symbols**	**18**	
27	Saturday	5-Nov-22	**Finite , Forward ,Backward , Central Differences**	**19**	
28	Sunday	6-Nov-22	SUNDAY		

29	Monday	7-Nov-22	**Newton's Forward ,Backward Difference Formulae**	**20**	
30	Tuesday	8-Nov-22	**T&P**		
31	Wednesday	9-Nov-22	**Gauss's Forward ,Backward Difference Formulae**	**21**	
32	Thursday	10-Nov-22	**Lagrange's Interpolation Formula**	**22**	
33	Friday	11-Nov-22	**Lagrange's Inverse Interpolation Formula**	**23**	
34	Saturday	12-Nov-22	**Problems**	**24**	
35	Sunday	13-Nov-22	SUNDAY		
36	Monday	14-Nov-22	**Problems**	**25**	
37	Tuesday	15-Nov-22	**T&P**	**26**	
38	Wednesday	16-Nov-22	**Problems**	**27**	
39	Thursday	17-Nov-22	**Problems**	**28**	
40	Friday	18-Nov-22	**Problems**	**29**	
41	Saturday	19-Nov-22	**Problems**	**30**	
42	Sunday	20-Nov-22	SUNDAY		
43	Monday	21-Nov-22	**Problems**	**31**	
44	Tuesday	22-Nov-22	**T&P**		
45	Wednesday	23-Nov-22	**Problems**	**32**	
46	Thursday	24-Nov-22	**Problems**	**33**	
47	Friday	25-Nov-22	**Problems**	**34**	
48	Saturday	26-Nov-22	**Problems**	**35**	
49	Sunday	27-Nov-22	SUNDAY		
50	Monday	28-Nov-22	**Unit :3 Numerical Methods-II**	**36**	

51	Tuesday	29-Nov-22	**T&P**		
52	Wednesday	30-Nov-22	**Trapezoidal Rule**	**37**	
53	Thursday	1-Dec-22	**Simpson's 1/3 Rule**	**38**	
54	Friday	2-Dec-22	**Simpson's 3/8 Rule**	**39**	
55	Saturday	3-Dec-22	**Applicatons & Problems**	**40**	
56	Sunday	4-Dec-22	SUNDAY		
57	Monday	5-Dec-22	Mid Exams		
58	Tuesday	6-Dec-22	Mid Exams		
59	Wednesday	7-Dec-22	Mid Exams		
60	Thursday	8-Dec-22	Mid Exams		
61	Friday	9-Dec-22	Mid Exams		
62	Saturday	10-Dec-22	Mid Exams		
63	Sunday	11-Dec-22	SUNDAY		
64	Monday	12-Dec-22	**Taylors Series Method for Solving First order ODE**	**41**	
65	Tuesday	13-Dec-22	**T&P**		
66	Wednesday	14-Dec-22	**Taylors Series Method for Solving Simultaneous First order ODE**	**42**	
67	Thursday	15-Dec-22	**Taylors Series Method for Solving Higher order ODE**	**43**	
68	Friday	16-Dec-22	**Picard's Method for Solving First order ODE**	**44**	
69	Saturday	17-Dec-22	**Picard's Method for Solving Simultaneous First order ODE**	**45**	
70	Sunday	18-Dec-22	SUNDAY		
71	Monday	19-Dec-22	**Picard's Method for Solving Higher order ODE**	**46**	
72	Tuesday	20-Dec-22	**T&P**		
73	Wednesday	21-Dec-22	**Euler's Method for Solving ODE**	**47**	
74	Thursday	22-Dec-22	**Modified Euler's Method for Solving ODE**	**48**	
75	Friday	23-Dec-22	**Problems**	**49**	
76	Saturday	24-Dec-22	**R-K Method of 2,3,4 orders for Solving ODE**	**50**	
77	Sunday	25-Dec-	SUNDAY		

		22			
78	Monday	26-Dec-22	**Problems**	**51**	
79	Tuesday	27-Dec-22	**T&P**		
80	Wednesday	28-Dec-22	**Problems**	**52**	
81	Thursday	29-Dec-22	**UNIT:4 Complex Variables (Differentiation)**	**53**	
82	Friday	30-Dec-22	**Limits , Continuity**	**54**	
83	Saturday	31-Dec-22	**Differentiation of Complex Functions**	**55**	
84	Sunday	1-Jan-23	SUNDAY		
85	Monday	2-Jan-23	**Analyticity of Complex Fuctions**	**56**	
86	Tuesday	3-Jan-23	**T&P**		
87	Wednesday	4-Jan-23	**C-R Equations**	**57**	
88	Thursday	5-Jan-23	**Harmonic Functions & Harmonic Conjugate**	**58**	
89	Friday	6-Jan-23	**Milne - Thomson Method**	**59**	
90	Saturday	7-Jan-23	**Problems**	**60**	
91	Sunday	8-Jan-23	SUNDAY		
92	Monday	9-Jan-23	**Elementary Analytical functions (exponential , trigonometric, logarithm) & their properties**	**61**	
93	Tuesday	10-Jan-23	**T&P**		
94	Wednesday	11-Jan-23	**Problems**	**62**	
95	Thursday	12-Jan-23	**Problems**	**63**	
96	Friday	13-Jan-23	**Sankrathi**		
97	Saturday	14-Jan-23	**Sankrathi**		
98	Sunday	15-Jan-23	SUNDAY		
99	Monday	16-Jan-23	**Unit:5 Complex Variables (Integration)**	**64**	
100	Tuesday	17-Jan-23	**T&P**		
101	Wednesday	18-Jan-23	**Line Integrals**	**65**	
102	Thursday	19-Jan-23	**Cauchy's Theorem**	**66**	
103	Friday	20-Jan-23	**Cauchy's Integral Formula , Generalized Cauchy's Integral Formula for Derivatives**	**67**	
104	Saturday	21-Jan-23	**Liouvillie's Theorem, Maximum Modulus Theorem**	**68**	

105	Sunday	22-Jan-23	SUNDAY		
106	Monday	23-Jan-23	**Taylor's Series , Laurent's Series**	**69**	
107	Tuesday	24-Jan-23	**T&P**	**70**	
108	Wednesday	25-Jan-23	**Zeros of analytical functions**	**71**	
109	Thursday	26-Jan-23	**Singularities & its types, Poles , Residues**	**72**	
110	Friday	27-Jan-23	**Cauchy's Residue Theorem**	**73**	
111	Saturday	28-Jan-23	**Problems**	**74**	
112	Sunday	29-Jan-23	SUNDAY		
113	Monday	30-Jan-23	**Revision**	**75**	
114	Tuesday	31-Jan-23	**T&P**		
115	Wednesday	1-Feb-23	**Revision**	**76**	
116	Thursday	2-Feb-23	**Revision**	**77**	
117	Friday	3-Feb-23	**Revision**	**78**	
118	Saturday	4-Feb-23	**Revision**	**79**	
119	Sunday	5-Feb-23	SUNDAY		
120	Monday	6-Feb-23	**Mid Exams**		
121	Tuesday	7-Feb-23	**Mid Exams**		
122	Wednesday	8-Feb-23	**Mid Exams**		
123	Thursday	9-Feb-23	**Mid Exams**		
124	Friday	10-Feb-23	**Mid Exams**		
125	Saturday	11-Feb-23	**Mid Exams**		
126	Sunday	12-Feb-23	SUNDAY		

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

REFERENCE BOOKS:

1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations ,

New Age International publishers.

2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

9. ASSIGNMENT QUESTIONS

Unit-I

1. Find a) L($\int_0^t te^{-t} sin4t$) b)$\int_0^\infty \frac{cosat-cosbt}{t}\, dt$ c) $L^{-1}(\frac{s^2}{s^4+4a^4})$

2. Find a) L($|sint|$) b) Find L(f(t)) if f(t)=$\begin{cases} 1\ if\ 0<t<2 \\ 2\ if\ 2<t<4 \\ 0\ if\ t>4 \end{cases}$

c) Find L(f(t)) if f(t)=$\begin{cases} \cos\left(t-\frac{\pi}{3}\right)\ if\ t<\frac{\pi}{3} \\ 0 \qquad if\ t>\frac{\pi}{3} \end{cases}$

3. Solve the following differential equations by using laplace transforms

a) $(D^2+n^2)x=a\sin(nt+\alpha)$ given x=Dx=0 at t=0.

b) y(t)=1-e^{-t} +$\int_0^t y(t-u)\, sinu\, du$

4a). Find L (e^{-3t} $\int_0^t \frac{sint}{t}\, dt$)

b). FindL^{-1}(log ($\frac{s+3}{s+4}$))

5a). Solve $y^{11} = t\cos 2t$ given y (0) =$y^{11}(0) = 0$

b) y (t) = 1-e^{-t} +$\int_0^t y(t-u)\, sinu\, du$

6. $L^{-1}(\frac{5s-2}{s^2(s+2)(s+3)})$

7. using convolution find $L^{-1}\left(\frac{1}{s(s^2+1)(s^2+4)(s^2+16)}\right)$

8.Evaluate L{e^t (cos 2t+(1/2)sinh 2t)}(2005 sep)

9 .Find the Laplace transform of e^{-3t} (2cos5t-3sin5t).(sep 2007)

10. Find the Laplace transform of e^{-t} (3sin 2t-5cosh 2t).(sep 2003)

11. Find the Laplace transform of e^{-at} sinh bt.(2003 sep)

12. Using the therom on transformation of derivatives, find the Laplace transform of e^{at}.(2000

13.Laplace transform of integral.(2003 sep)

14.Find $L^{-1}\{s/(s^2-a^2)\}$.(may 2006)

15.Find inverse laplace transform of $(s^2+s-2)/s(s+3)(s-2)$.(2005 sep)

16.Find inverse Laplace transform of $(s+2)/(s^2-2s+5)$.(2003 sep)

17.Find inverse Laplace transform of $(3s-14)/(s^2-4s+8)$.(may 2003).

Unit-II

1. Find the root of the equation x log x =1.2 using false position method.

2. Find the root of the equation $x^3-x-3=0$

3. By the method of least squares find the straight line that best fits the following data

x	1	2	3	4	5
y	14	27	40	55	68

4. Fit a parabola to the following data using the method of least squares.

x	1	3	7	9	11	13
y	3.49	8.69	19.09	24.29	29.49	34.69

5. Fit a polynomial of second degree to the data points (2, 3.07), (4, 12.85),(6, 31.47), (8, 57.38) and (10, 91.29).

6. Fit the curve $y= ae^{bx}$ to the following data.

x	0	0.5	1.0	1.5	2.0	2.5
y	0.10	0.45	2.15	9.15	40.35	180.7 5

7. Using Newton –Raphson method find square root of 24
8. Derive normal equations of a parabola by method of least squares

Unit-III

1. Dividing the range into 10 equal parts , find the value of $\int_0^{\frac{\pi}{2}} \sin x \, dx$, using i) . Trapezoidal rule

   ii). Simpson's $\frac{1}{3}$ rd rule. iii) Simpson's $\frac{3}{8}$ th rule

2. Use R-K method to evaluate y(0.1) and y(0.2) given that y' = x + y , y(0) = 1.

3. Use Taylors series method to find the approximate value of y when x=0.1 given that y(0)=1 ,y'=3x+y^2.

4. Find y(0.1)&y(0.2) using Euler's modified form given that y'=x^2-y, y(0)=1.

Unit-IV

1. Define derivative of a complex function and find derivative of $f(z) = z^n$ where n is +ve integer.
2. If $u = e^x(xcosy - ysiny)$ then find analytic function of f(z).
3. Show that $u = \frac{x}{x^2+y^2}$ is harmonic.
4. State and prove Cauchy-Riemann equations in polar form.
5. Show that $f(z) = z + \bar{z}$ is not analytic any where in the complex plane.
6. Define analytic function and entire function.
7. Find whether $f(z) = \frac{x-iy}{x^2+y^2}$ is not analytic or not.
8. Find all values of "k" such that $f(z) = e^x(xcosky + i\ ysinky)$ is analytic.
9. Prove that z^n (n is a +ve integer) is analytic and hence find its derivative.
10. Find analytic function whose real part is $\frac{x}{x^2+y^2}$.
11. Prove that the function of $f(z)$ defined by $f(z) = \begin{cases} \frac{x^3(1+x)-y^3(1-i)}{x^2+y^2}, & z \neq 0 \\ 0, & z = 0 \end{cases}$

    is continuous and C-R equations at the origin ,yet $f'(0)$ does not exist.
12. If $f(z)$ is an analytic function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$.

13 . Determine "p" so that the function $f(z) = \frac{1}{2}\log(x^2 + y^2) + tan^{-1}(\frac{px}{y})$ is analytic.

14. Find the analytic function $f(z) = u + iv\ if\ u - v = e^x(cosy - siny)$.

15. Determine the analytic function whose real part is $x^3 - 3xy^2 + 3x^2 - 3y^2 = 1$. Also find the harmonic conjugate of this real part.

16.Discuss the continuity of $f(x,y) = \begin{cases} \frac{2xy(x+y)}{x^2+y^2}, (x,y) \neq (0,0) \\ 0, (x,y) = (0,0) \end{cases}$

17. Construct the analytic function $f(z)$, whose real part is $e^x cosy$.

18. If $u(x,y) and\ v(x,y)$ are harmonic functions in a region R, prove that the function $\left(\frac{\partial u}{\partial y} - \frac{\partial v}{\partial x}\right) + i\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right)$ is an analytic function.

19. Prove that $f(z) = \begin{cases} \frac{xy^2(x+iy)}{x^2+y^4} & , z \neq 0 \\ 0 & , z = 0 \end{cases}$ is not analytic at $z = 0$ although C-R equations are satisfied at origin.

20. Prove that $f(z) = \sqrt{|xy|}$ is not analytic at $z = 0$ although C-R equations are satisfied at origin.

21. State and prove Cauchy-Riemann equations in Cartesian coordinates.

Unit-V

1. Expand $f(z) = sinz$ in Taylor's series about $z = \frac{\pi}{4}$.
2. Find Residue of $f(z) = \frac{z}{z^2+1}$ at its poles.
3. Find Residues of $f(z) = \frac{1}{(z+1)(z+2)}$ at its poles.
4. Expand $f(z) = tanz$ in Taylor's series about $z = 0$.
5. Expand $f(z) = \frac{z+3}{z(z^2-z-2)}$ for $|z| > 2$.
6. Evaluate $\int_0^{1+i} (x^2 - iy)dz$ along the path $y = x^2$.
7. Define following (i) Singular point (ii) isolated Singular point (iii) Essential Singularity (iv) Removable Singularity (v) pole of analytic function
8. Evaluate $\int_C \frac{z^3-sin3z}{\left(z-\frac{\pi}{2}\right)^3} dz$, where C is the circle $|z| = 2$ using Cauchy's integral formula.
9. Evaluate $\int_C \frac{sin\pi z^2+cos\pi z^2}{(z-1)(z-2)} dz$, where C is the circle $|z| = 3$ using Cauchy's integral formula.
10. Evaluate $\int_{1-i}^{2+i} (2x + 1 + iy)dz$ along the path $(1 - i)\ to\ (2 + i)$.
11. Obtain the expansion for sin $\left[\frac{1}{z-1}\right]$ which is valid in $1 < |z| < \infty$
12. Evaluate $\int_C \frac{(2z+1)^2}{z^8(4z^3+z)} dz$ over a unit circle C.
13. Evaluate $\int_C (x - 2y)dx + (y^2 - x^2)dy$ where C is the boundary of the first quadrant of the circle $x^2 + y^2 = 4$
14. Using Cauchy integral formula, find $\int_C \frac{e^{2z}}{(z+1)^3}$ dz , where C is the curve $|z| = 2$.
15. Evaluate $\int_C (x^2 - iy^2)\ dz$ along a straight line from (0,0) to (0,1) and then from (0,1) to (2,1).
16. Find Laurent's series of $\frac{z}{(z-1)(z-2)}$ about: a) $|z| < 1$ b) $|z| > 1$ c) $1 < |z| < 2$
17. Evaluate $\int_C \frac{1}{z^8(z+4)}$ dz, where C is the circle $|z| = 2$
18. Evaluate $\int_C \frac{z+4}{z^2+2z+5}$ dz where C is the circle (i) $|z + 1 - i| = 2$ (i) $|z + 1 + i| = 2$
19. If C is the boundary of the square with vertices at the points z=0, z=1, z=1+i, z=I show that $\int_C (3z + 1)dz = o$.
20. Represent the function f(z) = $\frac{1}{z(z+2)^3(z+1)^2}$ in Laurent series within $\frac{5}{4} \leq |z| \leq \frac{7}{4}$
21. Evaluate $\int_C \frac{dz}{z\,sin\,z}$ where C is the unit circle with centre at the origin.

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(Approved by AICTE, Affiliated to JNTU, Hyderabad)
KANDLAKOYA (V), MEDCHAL ROAD, HYDERABAD-501401.
Ph: 08418 200037, 92470 22662, Fax: 08418 200240, www.cmrec.ac.in

Department of Electronics and Communication Engineering

MID-I ASSIGNMENT QUESTIONS

1. Find a) L($\int_0^t te^{-t}sin4t$) b) $\int_0^{\infty} \frac{cosat-cosbt}{t}\ dt$ c) L^{-1}($\frac{s^2}{s^4+4a^4}$)

2. Find a) L($|sint|$) b) Find L(f(t)) if f(t)=$\begin{cases} 1\ if\ 0<t<2 \\ 2\ if\ 2<t<4 \\ 0\ if\ t>4 \end{cases}$

c) Find L(f(t)) if f(t)=$\begin{cases} \cos\left(t-\frac{\pi}{3}\right)\ if\ t<\frac{\pi}{3} \\ 0 \quad\quad if\ t>\frac{\pi}{3} \end{cases}$

3. Solve the following differential equations by using laplace transforms

a) $(D^2+n^2)x=a\sin(nt+\alpha)$ given x=Dx=0 at t=0.

b) y(t)=1-e^{-t} +$\int_0^t y(t-u)\ sinu\ du$

4. Find the root of the equation x log x =1.2 using false position method.

5. Find the root of the equation $x^3-x-3=0$

6. Dividing the range into 10 equal parts , find the value of $\int_0^{\frac{\pi}{2}} \sin x\ dx$, using i) . Trapezoidal rule

ii). Simpson's $\frac{1}{3}$ rd rule. iii) Simpson's $\frac{3}{8}$ th rule

MID-II ASSIGNMENT QUESTIONS

1. Use R-K method to evaluate y(0.1) and y(0.2) given that y' = x + y , y(0) = 1.
2. Use Taylors series method to find the approximate value of y when x=0.1 given that y(0)=1 ,y'=3x+y^2.
3. Define derivative of a complex function and find derivative of $f(z) = z^n$ where n is +ve integer.
4. If $u = e^x(xcosy - ysiny)$ then find analytic function of f(z).
5. Expand $f(z) = sinz$ in Taylor's series about $z = \frac{\pi}{4}$.
6. Find Residue of $f(z) = \frac{z}{z^2+1}$ at its poles.

10. SAMPLE ASSIGNMENT SCRIPTS:

LTNMCV Sample Assignment Scripts.rar

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

Department of Electronics and Communication Engineering

LTNMCV COURSE OUTCOMES (R20)

CO1	**Use** the Laplace transforms techniques forsolving ODE's.
CO2	**Find** the root of a given equation. **Estimate** the value for the given data using Interpolation.

CO3	**Find** the numerical solutions for givenODE's.
CO4	**Analyze** the complex function with reference to their analyticity, integration using Cauchy's Integral and Residue theorems.
CO5	**Examine** the Taylor's and Laurent's series expansions ofcomplex functions.

MID-I ASSIGNMENT QUESTIONS

Part - A

1. Find $L[\frac{cos2t - cos3t}{t}]$. (CO 1)
2. Find $L^{-1}[\frac{2s+1}{s^2+4s+13}]$. (CO 1)
3. Find the root of the equation $x\log_{10} x = 1.2$ using False position method. (CO 2)
4. Evaluate $\sqrt[3]{24}$ correct to four decimal places using Newton - Raphson method. (CO 2)
5. From the following table, find the area bounded by the curve and the x-axis from x = 2 to x =7 using Trapezoidal rule. (CO 3)

x:	2	3	4	5	6	7
f(x):	8	27	64	125	216	343

Part - B

6. Using Convolution theorem, find $L^{-1}[\frac{s}{(s^2+2^2)^2}]$. (CO 1)
7. Solve the differential equation using Laplace transforms $(D^2+3D+2)x = e^{-t}$, x(0) = 0, x'(0) = 1. (CO 1)
8. Find f(22) from the following table using Gauss's forward formula: (CO 2)

x:	20	25	30	35	40	45
f(x):	354	332	291	260	231	204

9. Given the values

x:	5	7	11	13	17
y = f(x):	150	392	1452	2366	5202

Evaluate f(9) using Lagrange's formula. (CO 2)

10. A rocket is launched from the ground. Its acceleration is registered during the first 80 seconds and is given as follows:

t(s)	0	10	20	30	40	50	60	70	80
a(m/s^2)	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

Using Simpson's $\frac{1}{3}$ rd rule, find the velocity and position of the rocket at t = 80 seconds. (CO 3)

11. Find the volume of a solid of revolution formed by rotating about the x-axis, the area bounded by the lines x = 0, x = 1.5, y = 0 and the curve passing through the following points using Simpson's $\frac{3}{8}$ th rule. (CO 3)

x:	0.00	0.25	0.50	0.75	1.00	1.25	1.50
y:	1.00	0.9826	0.9589	0.9089	0.8415	0.7624	0.7589

MID-I ASSIGNMENT QUESTIONS

Part - A

1. Find L [$\frac{cos2t-cos3t}{t}$]. (BL - 1) (CO 1)
2. Find L^{-1}[$\frac{2s+1}{s^2+4s+13}$]. (BL - 1) (CO 1)
3. Find the root of the equation $x \log_{10} x = 1.2$ using False position method. (BL - 1) (CO 2)
4. Evaluate $\sqrt[3]{24}$ correct to four decimal places using Newton Raphson Method. (BL - 5) (CO 2)
5. From the following table, find the area bounded by the curve and the x-axis from x = 2 to x = 7 using Trapezoidal rule. (BL - 1) (CO 3)

x:	2	3	4	5	6	7
f(x):	8	27	64	125	216	343

Part - B

6. Using Convolution theorem, find L^{-1}[$\frac{s}{(s^2+2^2)^2}$]. (BL - 1) (CO 1)
7. Solve the differential equation using Laplace transforms (D^2+3D+2)x = e^{-t}, x(0) = 0, x'(0) = 1. (BL - 3) (CO 1)
8. Find f(22) from the following table using Gauss's forward formula: (BL - 1) (CO 2)

x:	20	25	30	35	40	45
f(x):	354	332	291	260	231	204

9. Evaluate f(9) using Lagrange's formula: (BL - 5) (CO 2)

x:	5	7	11	13	17
y =f(x):	150	392	1452	2366	5202

10. Use Simpson's $\frac{1}{3}$ rd rule to find $\int_0^{0.6} e^{-x^2}\, dx$ by taking seven ordinates. (BL - 1) (CO 3)

11. Use Simpson's $\frac{3}{8}$ th rule evaluate $\int_0^1 \frac{\sin x}{x}\, dx$, taking h = $\frac{1}{6}$. (BL - 5) (CO 3)

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

Department of Electronics and Communication Engineering

LTNMCV COURSE OUTCOMES (R20)

CO1	**Use** the Laplace transforms techniques forsolving ODE's.
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CO4	**Analyze** the complex function with reference to their analyticity, integration using Cauchy's Integral and Residue theorems.
CO5	**Examine** the Taylor's and Laurent's series expansions ofcomplex functions.

MID-II ASSIGNMENT QUESTIONS

Part - A

1. Given y′ = x^2 - y, y(0) = 1, find correct to four decimal places the value of y (0.1) using Euler's Method. (CO 3)
2. Determine p such that the function f(z) = $\frac{1}{2}\log\ (x^2+y^2) + i\ \tan^{-1}(\frac{px}{y})$ to be an analytic function. (CO 4)

3. Show that $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = 4\frac{\partial^2}{\partial z \partial \bar{z}}$ (CO 4)

4. Find the poles of f(z) = $\cot z$. (CO 5)

5. Find the residue of f(z) = $\frac{z^3}{z^2-1}$ at z = ∞. (CO 5)

Part - B

6. Solve y′ = x + y, given y(0) = 1. Find y(0.1), y(0.2) by Picard's Method. (CO 3)

7. Use Runge - Kutta Method of order four to find y when x = 0.6 given that $\frac{dy}{dx} = 1 + y^2$, y(0) = 0. (CO 3)

8. Show that the function u(x,y) = $e^x \cos y$ is harmonic. Determine its harmonic conjugate v(x,y) and the analytic function f(z) = u + iv. (CO 4)

9. Find the analytic function f(z) = u + iv, where u + v = $\frac{\sin 2x}{\cosh 2y - \cos 2x}$. (CO 4)

10. Verify Cauchy's theorem for the function f(z) = $3z^2 + iz - 4$ if C is the square with vertices at $1 \pm i$, $-1 \pm i$. (CO 5)

11. Find the Laurent's expansion of f(z) = $\frac{7z-2}{z(z-2)(z+1)}$ valid in $1 < |z+1| < 3$. (CO 5)

MID-II ASSIGNMENT QUESTIONS

Part - A

1. Given y′ = x^2 - y, y(0) = 1, find correct to four decimal places the value of y (0.1) using Euler's Method. (BL - 1) (CO 3)
2. Determine p such that the function f(z) = $\frac{1}{2}\log\ (x^2+y^2) + i\ \tan^{-1}(\frac{px}{y})$ to be an analytic function. (BL - 5) (CO 4)
3. Show that $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = 4\frac{\partial^2}{\partial z \partial \bar{z}}$ (BL - 2) (CO 4)
4. Find the poles of f(z) = $\cot z$. (BL - 1) (CO 5)
5. Find the residue of f(z) = $\frac{z^3}{z^2-1}$ at z = ∞. (BL - 1) (CO 5)

Part - B

6. Solve y′ = x + y, given y(0) = 1. Find y(0.1), y(0.2) by Picard's Method. (BL - 3) (CO 3)

7. Use Runge - Kutta Method of order four to find y when x = 0.6 given that $\frac{dy}{dx} = 1 + y^2$, y(0) = 0. (BL - 1) (CO 3)

8. Show that the function u(x,y) = $e^x \cos y$ is harmonic. Determine its harmonic conjugate v(x,y) and the analytic function f(z) = u + iv. (BL - 2) (CO 4)

9. Find the analytic function f(z) = u + iv, where u + v = $\frac{\sin 2x}{\cosh 2y - \cos 2x}$. (BL - 1) (CO 4)

10. Verify Cauchy's theorem for the function f(z) = $3z^2 + iz - 4$ if C is the square with vertices at $1 \pm i$, $-1 \pm i$.

(BL - 5) (CO 5)

11. Find the Laurent's expansion of f(z) = $\frac{7z-2}{z(z-2)(z+1)}$ valid in $1 < |z+1| < 3$. (BL - 1) (CO 5)

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

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II. B.Tech - I – SEM

Subject: LTNMCV **Branch: ECE Sections: A,B,C** **Tutorial Questions**

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1. Find L[$\frac{cos2t - cos3t}{t}$]. (CO 1)

2. Using Convolution theorem, find L^{-1}[$\frac{s}{(s^2+2^2)^2}$]. (CO 1)

3. Find the root of the equation $x\log_{10} x = 1.2$ using False position method. (CO 2)

4. Find f(22) from the following table using Gauss's forward formula: (CO 2)

x:	20	25	30	35	40	45
f(x):	354	332	291	260	231	204

5. A rocket is launched from the ground. Its acceleration is registered during the first 80 seconds and is given as follows:

t(s)	0	10	20	30	40	50	60	70	80
a(m/s^2)	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

Using Simpson's $\frac{1}{3}$ rd rule, find the velocity and position of the rocket at t = 80 seconds. (CO 3)

6. Use Runge - Kutta Method of order four to find y when x = 0.1 given that $\frac{dy}{dx} = x + y^2$, y(0) = 1. (CO 3)

7. Determine p such that the function $f(z) = x^3 - pxy^2 + i(3x^2y - y^3)$ to be an analytic function. (CO 4)

8. Let u and v denote the real and imaginary components of the function f defined by means of the equations

$f(z) = \begin{cases} \frac{\bar{z}^2}{z}, when\ z \neq 0 \\ 0,\ when\ z = 0 \end{cases}$. Verify whether Cauchy Reimann equations are satisfied at the origin. (CO 4)

9. Find the poles of $f(z) = \frac{1}{z(e^z - 1)}$. (CO 5)

10. Evaluate the integral $\int_C \frac{dz}{z^3\,(z+4)}$ taken clockwise around the circle C : $|z + 2| = 3$. (CO 5)

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

II. B.Tech - I - SEM

Subject: LTNMCV **Branch: ECE Section: D** **Tutorial Questions**

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1. Find $L^{-1}[\frac{2s+1}{s^2+4s+13}]$. (CO 1)

2. Solve the differential equation using Laplace transforms $(D^2+3D+2)x = e^{-t}$, x(0) = 0, x'(0) = 1. (CO 1)

3. Evaluate $\sqrt[3]{24}$ correct to four decimal places using Newton - Raphson method. (CO 2)

4. Given the values

x:	5	7	11	13	17
y = f(x):	150	392	1452	2366	5202

Evaluate f(9) using Lagrange's formula. (CO 2)

5. Find the volume of a solid of revolution formed by rotating about the x-axis, the area bounded by the lines x = 0, x = 1.5, y = 0 and the curve passing through the following points using Simpson's $\frac{3}{8}$ th rule. (CO 3)

x:	0.00	0.25	0.50	0.75	1.00	1.25	1.50
y:	1.00	0.9826	0.9589	0.9089	0.8415	0.7624	0.7589

6. Use Runge - Kutta Method of order four to find y when x = 0.2 given that $\frac{dy}{dx} = x + y$, y(0) = 1. (CO 3)

7. Determine p such that the function f(z) = $\frac{1}{2}\log\ (x^2 + y^2) + i\ \tan^{-1}(\frac{px}{y})$ to be an analytic function. (CO 4)

8. Find the analytic function whose imaginary part is $y^2 - x^2$. (CO 4)

9. Let C denote the positively oriented boundary of the square whose sides lie along the lines x = ± 1, y = ± 1.

   Evaluate $\int_C \frac{dz}{3z^2+1}$ (CO 5)

10. Find the Laurent Series representation expansion of $\frac{e^z}{(z+1)^2}$ valid in $|z| > 1$. (CO 5)

MID-I TUTORIAL QUESTIONS

Part - A

1. Find L $[\frac{cos2t - cos3t}{t}]$. (BL - 1) (CO 1)
2. Find $L^{-1}[\frac{2s+1}{s^2+4s+13}]$. (BL - 1) (CO 1)
3. Find the root of the equation $x \log_{10} x = 1.2$ using False position method. (BL - 1) (CO 2)
4. Evaluate $\sqrt[3]{24}$ correct to four decimal places using Newton Raphson Method. (BL - 5) (CO 2)
5. From the following table, find the area bounded by the curve and the x-axis from x = 2 to x = 7 using Trapezoidal rule. (BL - 1) (CO 3)

x:	2	3	4	5	6	7
f(x):	8	27	64	125	216	343

Part - B

6. Using Convolution theorem, find $L^{-1}[\frac{s}{(s^2+2^2)^2}]$. (BL - 1) (CO 1)

7. Solve the differential equation using Laplace transforms $(D^2+3D+2)x = e^{-t}$, x(0) = 0, x'(0) = 1. (BL - 3) (CO 1)

8. Find f(22) from the following table using Gauss's forward formula: (BL - 1) (CO 2)

x:	20	25	30	35	40	45
f(x):	354	332	291	260	231	204

9. Evaluate f(9) using Lagrange's formula: (BL - 5) (CO 2)

x:	5	7	11	13	17
y =f(x):	150	392	1452	2366	5202

10. Use Simpson's $\frac{1}{3}$rd rule to find $\int_0^{0.6} e^{-x^2}\, dx$ by taking seven ordinates. (BL - 1) (CO 3)

11. Use Simpson's $\frac{3}{8}$th rule evaluate $\int_0^1 \frac{\sin x}{x}\, dx$, taking h = $\frac{1}{6}$. (BL - 5) (CO 3)

MID-II TUTORIAL QUESTIONS

Part - A

1. Given y′ = x^2 - y, y(0) = 1, find correct to four decimal places the value of y (0.1) using Euler's Method. (BL - 1) (CO 3)
2. Determine p such that the function f(z) = $\frac{1}{2}\log\ (x^2+y^2)+i\ \tan^{-1}(\frac{px}{y})$ to be an analytic function. (BL - 5) (CO 4)
3. Show that $\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2} = 4\frac{\partial^2}{\partial z\partial \bar{z}}$ (BL - 2) (CO 4)
4. Find the poles of f(z) = $\cot z$. (BL - 1) (CO 5)
5. Find the residue of f(z) = $\frac{z^3}{z^2-1}$ at z = ∞. (BL - 1) (CO 5)

Part - B

6. Solve y′ = x + y, given y(0) = 1. Find y(0.1), y(0.2) by Picard's Method. (BL - 3) (CO 3)

7. Use Runge - Kutta Method of order four to find y when x = 0.6 given that $\frac{dy}{dx} = 1 + y^2$, y(0) = 0. (BL - 1) (CO 3)

8. Show that the function u(x,y) = $e^x \cos y$ is harmonic. Determine its harmonic conjugate v(x,y) and the analytic function f(z) = u + iv. (BL - 2) (CO 4)

9. Find the analytic function f(z) = u + iv, where u + v = $\frac{\sin 2x}{\cosh 2y - \cos 2x}$. (BL - 1) (CO 4)

10. Verify Cauchy's theorem for the function f(z) = $3z^2 + iz - 4$ if C is the square with vertices at $1 \pm i$, $-1 \pm i$.

(BL - 5) (CO 5)

11. Find the Laurent's expansion of f(z) = $\frac{7z-2}{z(z-2)(z+1)}$ valid in $1 < |z+1| < 3$. (BL - 1) (CO 5)

11. UNIT-WISE COURSE MATERIAL:

LTNMCV Unitwise Course Material.rar

12. MID EXAM QUESTION PAPERS :

LTNMCV Mid Exam qps.rar

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

II. B.Tech - I - SEM -I MID EXAMINATIONS, Date: 11-11-2021 Time: FN:10.00AM TO 11.30AM

Subject: LTNMCV Branch: ECE Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.
Part - A is compulsory which carries 10 marks. Answer all questions in Part - A.
Part - B consists of ($2\frac{1}{2}$) units. Answer any one full question from each unit. Each question carries 5 marks and may have a,b,c sub questions.

Part - A **5x2 = 10**

1. Find L$[\frac{cos2t - cos3t}{t}]$. (CO 1)
2. Find $L^{-1}[\frac{2s+1}{s^2+4s+13}]$. (CO 1)
3. Find the root of the equation $x\log_{10} x = 1.2$ using False position method. (CO 2)
4. Evaluate $\sqrt[3]{24}$ correct to four decimal places using Newton - Raphson method. (CO 2)

5. From the following table, find the area bounded by the curve and the x-axis from x = 2 to x =7 using Trapezoidal rule. (CO 3)

x:	2	3	4	5	6	7
f(x):	8	27	64	125	216	343

Part - B **3x5 = 15**

6. Using Convolution theorem, find $L^{-1}[\frac{s}{(s^2+2^2)^2}]$. (CO 1)

(OR)

7. Solve the differential equation using Laplace transforms $(D^2+3D+2)x = e^{-t}$, x(0) = 0, x'(0) = 1. (CO 1)

8. Find f(22) from the following table using Gauss's forward formula: (CO 2)

x:	20	25	30	35	40	45
f(x):	354	332	291	260	231	204

(OR)

9. Given the values

x:	5	7	11	13	17
y = f(x):	150	392	1452	2366	5202

Evaluate f(9) using Lagrange's formula. (CO 2)

10. A rocket is launched from the ground. Its acceleration is registered during the first 80 seconds and is given as follows:

t(s)	0	10	20	30	40	50	60	70	80
a(m/s^2)	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

Using Simpson's $\frac{1}{3}$ rd rule, find the velocity and position of the rocket at t = 80 seconds. (CO 3)

(OR)

11. Find the volume of a solid of revolution formed by rotating about the x-axis, the area bounded by the lines x = 0, x = 1.5, y = 0 and the curve passing through the following points using Simpson's $\frac{3}{8}$ th rule. (CO 3)

x:	0.00	0.25	0.50	0.75	1.00	1.25	1.50
y:	1.00	0.9826	0.9589	0.9089	0.8415	0.7624	0.7589

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II. B.Tech - I - SEM - II MID EXAMINATIONS Date: 11-1-2022 Time: FN:10.00AM TO 11.30AM

Subject: LTNMCV Branch: ECE Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.
Part - A is compulsory which carries 10 marks. Answer all questions in Part - A.
Part - B consists of ($2\frac{1}{2}$) units. Answer any one full question from each unit. Each question carries 5 marks and may have a,b,c sub questions.

Part - A **5x2 = 10**

1. Given $y' = x^2 - y$, $y(0) = 1$, find correct to four decimal places the value of y (0.1) using Euler's Method. (CO 3)
2. Determine p such that the function f(z) = $\frac{1}{2}\log\ (x^2+y^2) + i\ \tan^{-1}(\frac{px}{y})$ to be an analytic function. (CO 4)
3. Show that $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = 4\frac{\partial^2}{\partial z \partial \bar{z}}$ (CO 4)
4. Find the poles of f(z) = $\cot z$. (CO 5)
5. Find the residue of f(z) = $\frac{z^3}{z^2-1}$ at z = ∞. (CO 5)

Part - B **3x5 = 15**

6. Solve $y' = x + y$, given y(0) = 1. Find y(0.1), y(0.2) by Picard's Method. (CO 3)

(OR)

7. Use Runge - Kutta Method of order four to find y when x = 0.6 given that $\frac{dy}{dx} = 1 + y^2$, y(0) = 0. (CO 3)

8. Show that the function u(x,y) = $e^x \cos y$ is harmonic. Determine its harmonic conjugate v(x,y) and the analytic function f(z) = u + iv. (CO 4)

(OR)

9. Find the analytic function f(z) = u + iv, where u + v = $\frac{\sin 2x}{\cosh 2y - \cos 2x}$. (CO 4)

10. Verify Cauchy's theorem for the function f(z) = $3z^2 + iz - 4$ if C is the square with vertices at $1 \pm i$, $-1 \pm i$. (CO 5)

(OR)

11. Find the Laurent's expansion of f(z) = $\frac{7z-2}{z(z-2)(z+1)}$ valid in $1 < |z+1| < 3$. (CO 5)

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

II. B.Tech - I - SEM - I MID EXAMINATIONS Date: 08-12-2022 Time:FN:10.00AM TO 11.30AM

Subject: LTNMCV Branch: ECE Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.
Part - A is compulsory which carries 10 marks. Answer all questions in Part - A.
Part - B consists of ($2\frac{1}{2}$) units. Answer any one full question from each unit. Each question carries 5 marks and may have a,b,c sub questions.

Part - A **5x2 = 10**

1. Find L $[\frac{cos2t - cos3t}{t}]$. (BL - 1) (CO 1)
2. Find $L^{-1}[\frac{2s+1}{s^2+4s+13}]$. (BL - 1) (CO 1)

3. Find the root of the equation $x \log_{10} x = 1.2$ using False position method. (BL - 1) (CO 2)

4. Evaluate $\sqrt[3]{24}$ correct to four decimal places using Newton Raphson Method. (BL - 5) (CO 2)

5. From the following table, find the area bounded by the curve and the x-axis from x = 2 to x = 7 using Trapezoidal rule. (BL - 1) (CO 3)

x:	2	3	4	5	6	7

f(x):	8	27	64	125	216	343

Part - B **3x5 = 15**

6. Using Convolution theorem, find $L^{-1}[\frac{s}{(s^2+2^2)^2}]$. (BL - 1) (CO 1)

(OR)

7. Solve the differential equation using Laplace transforms $(D^2+3D+2)x = e^{-t}$, x(0) = 0, x'(0) = 1. (BL - 3) (CO 1)

8. Find f(22) from the following table using Gauss's forward formula: (BL - 1) (CO 2)

x:	20	25	30	35	40	45
f(x):	354	332	291	260	231	204

(OR)

9. Evaluate f(9) using Lagrange's formula: (BL - 5) (CO 2)

x:	5	7	11	13	17
y =f(x):	150	392	1452	2366	5202

10. Use Simpson's $\frac{1}{3}$ rd rule to find $\int_0^{0.6} e^{-x^2}\,dx$ by taking seven ordinates. (BL - 1) (CO 3)

(OR)

11. Use Simpson's $\frac{3}{8}$ th rule evaluate $\int_0^1 \frac{\sin x}{x}\,dx$, taking h = $\frac{1}{6}$. (BL - 5) (CO 3)

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

SCHEME OF EVALUATION

DESCRIPTIVE TEST - I A.Y: 2022-2023

Branch : ECE **Subject : LTNMCV**

Class : II B.Tech **Max marks : 25**

Time : 10.00 AM T0 11-30 AM.

Note: Question paper contains two parts, Part - A and Part - B.
Part - A is compulsory which carries 10 marks. Answer all questions in Part - A.
Part - B consists of ($2\frac{1}{2}$) units. Answer any one full question from each unit. Each question carries 5 marks and may have a,b,c sub questions.

S.No.	THEORY	MARKS	TOTAL
1.	Formula	1	2
	Procedure	0.5	

	Final answer	0.5	
2.	Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
3.	False Position Method Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
4.	N-R Method Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
5.	Trapezoidal Rule	1	2
	Procedure	0.5	
	Final answer	0.5	
TOTAL			**10**
6.	Convolution Formula	2	5
	Procedure	2	
	Final answer	1	
7.	Formula	2	5
	Procedure	2	
	Final answer	1	
8.	Gauss Forward Formula	2	5
	Procedure	2	
	Final answer	1	
9.	Lagrange's Formula	2	5
	Procedure	2	
	Final answer	1	
10.	Simpson's $1/3^{rd}$ Rule	2	5
	Procedure	2	
	Final answer with Verification	1	
11.	Simpson's $3/8^{th}$ Rule	2	5
	Procedure	2	
	Final answer	1	

TOTAL	**15**

TOTAL	**25**

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

II. B.Tech - I - SEM - II MID EXAMINATIONS Date: 09-02-2023 Time:FN:10.00AM TO 11.30AM

Subject: LTNMCV Branch: ECE Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.
Part - A is compulsory which carries 10 marks. Answer all questions in Part - A.
Part - B consists of ($2\frac{1}{2}$) units. Answer any one full question from each unit. Each question carries 5 marks and may have a,b,c sub questions.

Part - A **5x2 = 10**

1. Given $y' = x^2 - y$, $y(0) = 1$, find correct to four decimal places the value of y (0.1) using Euler's Method. (BL - 1) (CO 3)
2. Determine p such that the function $f(z) = \frac{1}{2}\log\ (x^2 + y^2) + i\ \tan^{-1}(\frac{px}{y})$ to be an analytic function. (BL - 5) (CO 4)
3. Show that $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = 4\frac{\partial^2}{\partial z \partial \bar{z}}$ (BL - 2) (CO 4)
4. Find the poles of $f(z) = \cot z$. (BL - 1) (CO 5)
5. Find the residue of $f(z) = \frac{z^3}{z^2-1}$ at $z = \infty$. (BL - 1) (CO 5)

Part - B **3x5 = 15**

6. Solve y′ = x + y, given y(0) = 1. Find y(0.1), y(0.2) by Picard's Method. (BL - 3) (CO 3)

(OR)

7. Use Runge - Kutta Method of order four to find y when x = 0.6 given that $\frac{dy}{dx} = 1 + y^2$, y(0) = 0. (BL - 1) (CO 3)

8. Show that the function u(x,y) = $e^x \cos y$ is harmonic. Determine its harmonic conjugate v(x,y) and the analytic function f(z) = u + iv. (BL - 2) (CO 4)

(OR)

9. Find the analytic function f(z) = u + iv, where u + v = $\frac{\sin 2x}{\cosh 2y - \cos 2x}$. (BL - 1) (CO 4)

10. Verify Cauchy's theorem for the function f(z) = $3z^2 + iz - 4$ if C is the square with vertices at $1 \pm i$, $-1 \pm i$. (BL - 5) (CO 5)

(OR)

11. Find the Laurent's expansion of f(z) = $\frac{7z-2}{z(z-2)(z+1)}$ valid in $1 < |z+1| < 3$. (BL - 1) (CO 5)

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

SCHEME OF EVALUATION

DESCRIPTIVE TEST - II **A.Y: 2022-2023**

Branch : ECE **Subject : LTNMCV**

Class : II B.Tech **Max marks : 25**

Time : 10.00 AM T0 11-30 AM.

Note: Question paper contains two parts, Part - A and Part - B.
Part - A is compulsory which carries 10 marks. Answer all questions in Part - A.
Part - B consists of ($2\frac{1}{2}$) units. Answer any one full question from each unit. Each question carries 5 marks and may have a,b,c sub questions.

S.No.	THEORY	MARKS	TOTAL
1.	Euler's Formula	1	2
	Procedure	0.5	

	Final answer	0.5	
2.	Partial derivatives of u and v, C-R equations	1	2
	Procedure	0.5	
	Final answer	0.5	
3.	Partial derivatives	1	2
	Procedure	0.5	
	Final answer	0.5	
4.	Poles Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
5.	Residues Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
TOTAL			**10**
6.	Picard's Formula	2	5
	Procedure	2	
	Final answer	1	
7.	Rung Kutta Method Formula	2	5
	Procedure	2	
	Final answer	1	
8.	Harmonic Formula	2	5
	Procedure	2	
	Final answer	1	
9.	Milne Thompson Formula	2	5
	Procedure	2	
	Final answer	1	
10.	Cauchy's Theorem Formula, Diagram	2	5
	Procedure	2	
	Final answer with Verification	1	
11.	Partial Fractions	2	5
	Procedure	2	

	Final answer	1	
TOTAL			**15**

TOTAL	**25**

13. SAMPLE MID ANSWERS SCRIPTS:

Submitted in Exam Branch

14. MATERIAL COLLECTED FROM INTERNET OR WEBSITES:

1. https://www.youtube.com/watch?v=EDVJotmT584
2. https://www.youtube.com/watch?v=qhUIx096afA
3. https://www.youtube.com/watch?v=iviiGB5vxLA
4. https://www.youtube.com/watch?v=t9xW7UaZwZ0&list=PLU6SqdYcYsfI3sh-ho_iiTkCGsTbVh_Sw
5. https://www.youtube.com/watch?v=ywQVarOaA60

15. POWER POINT PRESENTATIONS (PPTS):

1. **https://www.myprivatetutor.ae/prime/documents/ppts/details/185/laplace-transform-ppt-presentation**
2. **https://www.slideshare.net/gauravsitu/numerical-method-15623481**
3. **https://www.slideshare.net/Mohammed_AQ/numerical-integration-seminar-15**
4. **https://www.slideshare.net/PanchalAnand/numerical-solution-of-ordinary-differential-equations-gtu-cvnm-ppt**
5. **https://www.slideshare.net/hishamalmahsery/complex-numbers-and-functions-complex-differentiation**

6. **https://www.slideshare.net/AmitAmola/integration-in-the-complex-plane-52008858**

16. UNIVERSITY QUESTION PAPERS/ QUESTION BANK:

LTNMCV PQP.rar

17. REFERENCES (Text books /Websites or Journals)

TEXT BOOKS:

T1. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

T2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

T3.J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

REFERENCE BOOKS:

R1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, New Age International publishers.

R2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.