Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY, BANGALORE



Academic Year 2019-20

Program:	B E – Information Science& Engineering
Semester:	3
Course Code:	18MAT31
Course Title:	Transform Calculus, Fourier Series And Numerical Techniques
Credit / L-T-P:	3 / 2-2-0
Total Contact Hours:	50
Course Plan Author:	Smitha N

Academic Evaluation and Monitoring Cell

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Table of Contents

A. COURSE INFORMATION	3
1. Course Overview	3
2. Course Content	3
3. Course Material	
4. Course Prerequisites	4
5. Content for Placement, Profession, HE and GATE	4
B. OBE PARAMETERS	4
1. Course Outcomes	4
2. Course Applications	5
3. Mapping And Justification	
4. Articulation Matrix	7
5. Curricular Gap and Content	
6. Content Beyond Syllabus	
C. COURSE ASSESSMENT	8
1. Course Coverage	8
2. Continuous Internal Assessment (CIA)	8
D1. TEACHING PLAN - 1	9
Module - 1	9
Module – 4	
E1. CIA EXAM – 1	11
a. Model Question Paper - 1	11
b. Assignment -1	12
D2. TEACHING PLAN - 2	14
Module – 5	
Module – 2	
E2. CIA EXAM – 2	16
a. Model Question Paper - 2	16
b. Assignment – 2	
D3. TEACHING PLAN - 3	19
Module – 3	
E3. CIA EXAM – 3	20
a. Model Question Paper - 3	
b. Assignment – 3	
F. EXAM PREPARATION	21
1. University Model Question Paper	
2. SEE Important Questions	
G. Content to Course Outcomes	26
1. TLPA Parameters	
2. Concepts and Outcomes:	
ote: Remove "Table of Content" before including in CP Book Each Course Plan shall be printed and made into a book with cover page Blooms Level in all sections match with A.2, only if you plan to teach / learn at h	nigher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	IS
Semester:	3	Academic Year:	2019-20
Course Title:	Transform Calculus, Fourier Series and Numerical Techniques	Course Code:	18MAT31

Credit / L-T-P:	3 / 2-2-0	SEE Duration:	180 Minutes
Total Contact Hours:	50 Hours	SEE Marks:	60 Marks
CIA Marks:	40 Marks	Assignment	1 / Module
Course Plan Author:	Smitha N	Sign	Dt:21-10-2019
Checked By:	Mallikarjun G D	Sign	Dt:26-10-2019
CO Targets	CIA Target: 90%	SEE Target:	70 %

Note: Define CIA and SEE % targets based on previous performance.

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Mod	Content	Teachin	Identified Module	Blooms
ule		g Hours	Concepts	Learning
				Levels
1	Laplace transforms of elementary functions. Laplace transforms of	_	Differential	L3
	periodic functions and unit step functions.		Equations	
1	Inverse laplace transforms, convolution theorem to find the inverse		Differential	L3
	laplace transforms and problems. Solution of linear differential		Equations	
	equations using Laplace transform.			
2	Fourier series of 2∏,21 period & half range fourier series		Analyze	L3
			circuits&system	
			communication	.
2	Practical Harmonic analysis.		Analyze	L4
			circuits&system	
			communication	T 0
3	Infinite Fourier transforms, fourier sine and cosine transforms &		Continuous signal	L3
2	Fourier inverse transforms		process	1.2
3	Z-transforms and inverse z-transforms	-	Discrete signal	L3
4	N 1 Col. diagram of ODE of Cont 1 1 Tools are		process	1.2
4	Numerical Solutions of ODE of first order and degree-Taylor's		Ordinary	L3
	Method, Modified Euler's Equations		Differential	
4	DV mothed Milne's and Adams Dealtforth mothed		Equations.	1.2
4	RK method, Milne's and Adams Bashforth method	-	Ordinary Differential	L3
			Equations.	
5	Numerical Solutions of second order ODE using Runge-Kutta method		Ordinary	L3
)	and Milne's Method.	,	Differential	LS
	and within 5 wellou.		Equations.	
5	Variational problems, euler's equations, geodesics and problems		Maximum and	I.4
	variational problems, cuter 3 equations, geodesics and problems		minimum	LA
L			1111111111111111	

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

- 1. Understanding: Concept simulation / video; one per concept; to understand the concepts; 15 30 minutes
- 2. Design: Simulation and design tools used software tools used; Free / open source
- 3. Research: Recent developments on the concepts publications in journals; conferences etc.

Module	Details	Chapters	Availability
Module	Details	1	Availability
S		in book	
	Text books (Title, Authors, Edition, Publisher, Year.)	-	-
1,2,3,4	1;.B.S Grewal, higher engineering mathematics		In Lib/dept
,5			
1,2,3,4	2:Advanced engineering mathematics by ERWIN KREYZIG		In Lib/dept
,5			
1,2,3,4	3:Advanced engineering mathematics by PETER V. O'NEIL		In Lib/dept
,5			
В	Reference books (Title, Authors, Edition, Publisher, Year.)	-	-
1,2,3,4			In dept
	mathematics, laxmi publishers, 7th edition, 2010		

,5			
1,2,3,4	2: B.V Ramana:Higher engineering mathematics TATA McGRAW-HILL 2006		In Lib
C	Concept Videos or Simulation for Understanding	-	-
1	https://www.khanacademy.org/math/differential-equations/laplace-		
	transform/laplace-transform-tutorial/v/laplace-transform-1		
2	https://www.youtube.com/watch?v=KeT6CB6Qi10		
3	https://www.youtube.com/watch?v=mJgVOV9jRZU		
5	https://www.youtube.com/watch?v=GiPOQC5nYMs		
D	Software Tools for Design		
E	Recent Developments for Research	-	-
F	Others (Web, Video, Simulation, Notes etc.)	-	-
4	https://www.youtube.com/watch?v=Os8OtXFBLkY		
4	https://www.geeksforgeeks.org/runge-kutta-4th-order-method-solve-differential- equation/		
5	https://www.youtube.com/watch?v=zr12pnzNoXI		

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

Students must have learnt the following Courses / Topics with described Content . . .

Modu	Course	Course Name	Topic / Description	Sem	Remarks	Blooms
les	Code					Level
1	17MAT21	Transform	Module-1/Evaluation	2	Revision	L2
		Calculus, Fourier	of homogeneous and			
		Series and	non homogeneous			
		Numerical	differential equations.			
		Techniques				

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.

Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Modu	Topic / Description	Area	Remarks	Blooms
les				Level
1				
2				

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

	r co per com	- Par					
Modu	Course	Course Outcome	Teach.	Concept	Instr	Assessment	Blooms'
les	Code.#	At the end of the course, student	Hours		Method	Method	Level
		should be able to					
1	18MAT31.1	Use laplace transform in solving	5	Differential	Lecture	Assignmen	L3
		Differential equations arising in		equations		t and Slip	
		network analysis, control systems and				Test	

		other fields of engineering.					
1	18MAT31.2	Use inverse laplace transform in solving Differential/ integral equations arising in network analysis, control systems and other fields of engineering.	5	Differential equations	Lecture	Assignmen t and Slip Test	L3
2	18MAT31.3	Analyze expansion of Fourier series using Euler formula	6	Analyze circuits&syst em communicati on	Lecture	Assignmen t and Slip Test	L3
2		Apply Fourier expansion in practical harmonic problems	4	Analyze circuits&syst em communicati on	Lecture	Assignmen t and Slip Test	L4
3		Apply to transform form one to another domain by Fourier integrals	5	Continuous signal process	Lecture	Assignmen t and Slip Test	L3
3	18MAT31.6	Apply to transform one domain to another domain by z-transforms	5	Discrete signal process	Lecture	Assignmen t and Slip Test	L3
4		Use appropriate single step numerical methods to solve first order ordinary differential equations.	6	O.D.E	Lecture	Assignmen t and slip test	L3
4		Use appropriate multi-step numerical methods to solve first order ordinary differential equations arising in flow data design problems.	4	O.D.E	Lecture	Assignmen t and slip test	L3
5		Use appropriate multi-step numerical methods to solve second order ordinary differential equations arising in flow data design problems.	5	Differential equations	Lecture	Assignmen t and slip test	L3
5	18MAT31.10	Analyze how to apply the Euler's equations for a given function by Euler's equation	5	maximum& minimum	Lecture	Assignmen t and Slip Test	L4
-	-		50	-	-	-	-

2. Course Applications

Write 1 or 2 applications per CO.

Students should be able to employ / apply the course learnings to . . .

Modu	Application Area	CO	Level
les	Compiled from Module Applications.		
1	To study the nature of signals and control systems.	CO1	L3
		&C02	
2	To solve equations arising in network analysis and other fields of engineering.	CO3	L3
2	To study the nature of wave forms in voltage- current characteristics.	CO4	L3
3	Used to convert to discrete time domain signal into discrete frequency domain signal.	CO5	L3
3	To study the continuous and Apply to transform one domain to another domain by z-transforms	CO6	L3
	discrete signals and its properties.		
4	To solve first order ODE using single step numerical methods	CO7	L3
4	To solve first order ODE using single step and multistep numerical methods	CO8	L3
5	To solve first order and second order ODE using single step numerical methods	CO9	L3
5	To determine extremal functions arising in dynamics of rigid bodies and vibrational analysis in	CO10	L4
	the field of civil engineering.		

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.

To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Mo	Mapping	Mappin	Justification for each CO-PO	pair I.	ev

dul			g Level		el
es					
-	CO	PO	-	'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'	-
1	CO1	PO1	L3	Apply the knowledge of Laplace transforms to find the solution to complex engineering problems	L3
1	CO1	PO2	L4	To analyze and study the nature of signals and control systems.	L4
1	CO2	PO1	L3	Apply the knowledge of Laplace transforms and inverse laplace transforms to find the solution to complex engineering problems	L3
1	CO2	PO2	L4	To analyze and study the nature of signals and control systems.	L4
2	CO3	PO1	L3	Apply the knowledge of Fourier series to find the solution to complex engineering problems.	L3
2	CO3	PO2	L4	To analyze boundary value problems for linear ODE's	L4
2	CO4	PO1	L3	Apply the knowledge of Fourier series to find the solution to complex engineering problems.	L3
2	CO4	PO2	L3	To analyze boundary value problems for linear ODE's	L3
3	CO5	PO1	L3	Apply the knowledge of Fourier transforms to find solution to complex engineering problems.	L3
3	CO5	PO2	L4	To analze time domain and frequency domain in signal processing.	L4
3	CO6	PO1	L3	Apply the knowledge of Z-Transforms to find the solution to complex engineering problems.	L3
3	CO6	PO2	L4	To Analyze digital filters and discrete signal.	L4
4	CO7	PO1	L3	Apply the knowledge of Numerical techniques to solve ordinary differential equations	L3
4	CO7	PO2	L4	To analyze and solve first order ODE using single step numerical methods	L4
4	CO8	PO1	L3	Apply the knowledge of Numerical techniques to solve ordinary differential equations	L3
4	CO8	PO2	L4	To analyze and solve first order ODE using single step and multistep numerical methods	L4
5	CO9	PO1	L3	Apply the knowledge of Numerical techniques to solve ordinary differential equations	L3
5	CO9	PO2	L4	To analyze and apply first order and second order ODE using single step numerical methods	L4
5	CO10	PO1	L3	Apply the knowledge of calculus in solving complex engineering problems.	L3
5	CO10	PO2	L4	To analyze the rotation of a rigid body using a reference frame with its axis fixed to the body.	L4

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

	Omapping	with mapping level for each CO-1 O pa	,	** 1 (11	COU	1150												
-	-	Course Outcomes						Prog										-
Modu	CO.#	At the end of the course student	PO	PO	PO	PO	PO			PO	PO	PO	PO	PO	PS	PS :	PS	Lev
les		should be able to	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	O3	el
1	CO1	Use laplace transform in solving	2.5	2.5														L3
		Differential equations arising in																
		network analysis, control systems and																
		other fields of engineering.																
1	CO2	Use inverse laplace transform in	2.5	2.5														L3
		solving Differential/ integral																
		equations arising in network analysis,																
		control systems and other fields of																
		engineering.																
2	CO3	Analyze expansion of Fourier series	2.5	2.5														L3
		using Euler formula																
2	CO4	Apply Fourier expansion in practical	2.5	2.5														L4
		harmonic problems																
3	CO5	Apply to transform form one to	2.5	2.5														L3
		another domain by Fourier integrals																
3	CO6	Apply to transform one domain to	2.5	2.5														L3
		another domain by z-transforms																
4	CO7	Use appropriate single step numerical	2.5	2.5														L3
		methods to solve first order ordinary																

		differential equations.	1
4	CO8	Tr- r- r	L3
		methods to solve first order ordinary	
		differential equations arising in flow	
		data design problems.	
5	CO9	Use appropriate multi-step numerical 2.5 2.5	L3
		methods to solve second order	
		ordinary differential equations arising	
		in flow data design problems.	
5	CO10		L4
		equations for a given function by	
		Euler's equation	

5. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Modu	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
les					

6. Content Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Modu	Gap Topic	Area	Actions Planned	Schedule Planned	Resources Person	PO Mapping
les						

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Mod	Title	Teach.		No. o	of quest	ion in F	Exam		CO	Levels
ules		Hours	CIA-1	CIA-2	CIA-3	Asg	Extra	SEE		
							Asg			
1	Laplace transforms	10	2	-	-	1		2	CO1, CO2	L3
4	Numerical Methods-1	10	2	-	-	1		2	CO7,CO8	L3
5	Numerical methods and Calculus of	10	-	2	-	1		2	CO9,CO10	L4
	variations									
2	Fourier series	10	-	2	-	1		2	CO3,CO4	L4
3	Fourier Transforms and	10	-	-	4	1		2	CO5,CO6	L3
	Z- Transforms									
-	Total	50	4	4	4	5		10	-	-

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Modul	Evaluation	Weightage in	CO	Levels
es		Marks		
1 &4	CIA Exam – 1	30	CO1, CO2, CO7,CO8	L3
2 & 5	CIA Exam – 2	30	CO3,CO4 ,CO9, CO10	L4
3	CIA Exam – 3	30	CO5,CO6	L3
1 &4	Assignment - 1	10	CO1, CO2, CO7,CO8	L3
2 & 5	Assignment - 2	10	CO3,CO4 ,CO9, CO10	L4
3	Assignment - 3	10	CO5,CO6	L3
			_	· · · · · · · · · · · · · · · · · · ·

Seminar - 1	-	-	-
Seminar - 2	-	-	-
Seminar - 3	-	-	-
	-	-	=
Other Activities – define – Slip test	-	-	=
Final CIA Marks	40	-	-

D1. TEACHING PLAN - 1

Module - 1

Title:	Laplace Transforms and Inverse Laplace Transforms	Appr Time:	10Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Use laplace transform in solving Differential equations arising in network analysis control systems and other fields of engineering.	,CO1	L3
2	Use inverse laplace transform in solving Differential/integral equations arising in network analysis, control systems and other fields of engineering.	CO2	L3
b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
1	Laplace transforms of elementary functions.	CO1	L3
2	Laplace transforms of periodic functions	CO1	L3
3	Problems on periodic functions	CO1	L3
4	Unit step functions	CO1	L3
5	Problems on unit step functions	CO1	L3
6	Inverse laplace transforms,	CO2	L3
7	Convolution theorem to find the inverse laplace transforms	CO2	L3
8	Additional problems	CO2	L3
9	Solution of linear differential equations using Laplace transform.	CO2	L3
10	Additional problems	CO2	L3
c	Application Areas	СО	Level
1	To study the nature of signals and control systems.	CO1	L3
2	To solve equations arising in network analysis and other fields of engineering.	CO2	L3
d	Review Questions	-	-
1	Find the laplace transform of $(i)te^{(-4t)}\sin 3t(ii)\frac{(e^{(at)}-e^{(-at)})}{(e^{(at)}-e^{(-at)})}$	CO1	L3
	Find the laplace transform of $(i)te^{(-4t)}\sin 3t(ii)\frac{(e^{(at)}-e^{(-at)})}{t}$		
2	Find the laplace transform of $(i)te^{(-4t)}\sin 3t(ii)\frac{(e^{(at)}-e^{(-at)})}{t}$ Express in terms of unit step function and hence find its laplace transform $f(t)=cost0 < t < \pi$ { $1\pi < t < 2\pi$	CO1	L3 L3
	Express in terms of unit step function and hence find its laplace transform $f(t) = cost0 < t < \pi$ { $1\pi < t < 2\pi$ $sintt > 2\pi$		
	Express in terms of unit step function and hence find its laplace transform $f(t) = cost0 < t < \pi$ { $1\pi < t < 2\pi$ $sintt > 2\pi$ Solve by using laplace transforms $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ and $y(0) = y'(0) = 0$		
2	Express in terms of unit step function and hence find its laplace transform $f(t) = cost0 < t < \pi$ { $1\pi < t < 2\pi$ $sintt > 2\pi$ Solve by using laplace transforms $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ and $y(0) = y'(0) = 0$ If a periodic function of period $2a$ is defined by $f(t) = \begin{cases} tif0 < t < a \\ 2a - tifa < t < 2a \end{cases}$ then	CO1	L3
3 4	Express in terms of unit step function and hence find its laplace transform $f(t) = cost0 < t < \pi$ { $1\pi < t < 2\pi$ $sintt > 2\pi$ Solve by using laplace transforms $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ and $y(0) = y'(0) = 0$ If a periodic function of period $2a$ is defined by $f(t) = \begin{cases} tif0 < t < a \\ 2a - tifa < t < 2a \end{cases}$ show that $L[f(t)] = (\frac{1}{s^2}) \tanh(\frac{as}{2})$	CO1	L3
3	Express in terms of unit step function and hence find its laplace transform $f(t) = cost0 < t < \pi$ $\{1\pi < t < 2\pi \\ sintt > 2\pi \}$ Solve by using laplace transforms $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ and $y(0) = y'(0) = 0$ If a periodic function of period $2a$ is defined by $f(t) = \{ tif 0 < t < a \}$ show that $L[f(t)] = (\frac{1}{s^2}) \tanh(\frac{as}{2})$ Find the inverse laplace transform of $\frac{(4s+5)}{((s-1)^2(s+2))}$	CO1	L3
3 4	Express in terms of unit step function and hence find its laplace transform $f(t) = cost0 < t < \pi$ { $1\pi < t < 2\pi$ $sintt > 2\pi$ Solve by using laplace transforms $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ and $y(0) = y'(0) = 0$ If a periodic function of period $2a$ is defined by $f(t) = \begin{cases} tif0 < t < a \\ 2a - tifa < t < 2a \end{cases}$ then	CO1	L3 L3 L4

8	If a periodic function of period $\frac{(2\pi)}{w}$ is defined by $f(t) = \begin{cases} Esinwtif 0 < t < \frac{\pi}{w} \\ 0 if \frac{\pi}{w} < t < \frac{(2\pi)}{w} \end{cases}$ then show that $L[f(t)] = \frac{Ew}{(s^2 + w^2)(1 - e^{(\frac{-as}{w})})}$	CO1	L4	
e	Experiences	-	-	
1				1
2				

Module-4

Title:	Numerical Solution Of ODE's:	Appr Time:	10 Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Use appropriate single step numerical methods to solve first order ordinary differential equations.	CO7	L3
2	Use appropriate multi-step numerical methods to solve second order ordinary differential equations arising in flow data design problems.	CO8	L3
b	Course schedule	-	-
	Module Content Covered	CO	Level
1	Numerical solution of ordinary differential	CO7	L3
	equations of first order and first degree, by Taylor's series method		
2	Taylor's series method	CO7	L3
3	Numerical solution of ordinary differential	CO7	L3
	equations of first order and first degree, by modified Euler's method		
4	Numerical solution of ordinary differential	CO7	L3
	equations of first order and first degree, by modified Euler's method		
5	Runge - Kutta method of fourth order.	CO7	L3
6		CO7	L3
7	Runge - Kutta method of fourth order.	CO8	L3
	Milne's predictor and corrector methods Additional problems	CO8	L3
9	1	CO8	L3
10	Adams-Bashforth predictor and corrector methods		L3
10	Additional problems	CO8	L3
c	Application Areas	CO	Level
1	To solve first order ODE using single step numerical methods	CO7	L3
2	To solve first order ODE using single step and multistep numerical methods	CO8	L3
d	Review Questions	-	-
1	Use Taylor's method to find y at $x = 0.1, 0.2, 0.3$ of the problem $\frac{dy}{dx} = x^2 + y^2$ with	CO7	L3
	y(0) = 1. Consider upto 3 rd degree terms.	G07	T 2
2	Using Euler's modified method, solve for y at $x = 0.1$ if $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$.	CO7	L3
3	Carry out three modifications.	CO7	L3
3	Apply Runge Kutta method of order four compute $y = 0.2$ given $10 \frac{dy}{dx} = x^2 + y^2$ with $y(0) = 1$ taking h=0.2	COT	L3
4	Solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ find y at $x = 0.2$ using RK method taking h=0.2	CO7	L3
5	Given $\frac{dy}{dx} = xy + y^2$ with $y(0) = 1, y(0.1) = 1.1169, y(0.2) =$	CO8	L3
	1.2773, $y(0.3) = 1.5049$ find $y(0.4)$ correct to three decimal places using Milne's method.		
6	Given $\frac{dy}{dx} = (1+y)x^2$ and $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) =$	CO8	L3

	1.548, $y(1.3) = 1.979$ find $y(1.4)$ by Adams-Bashforth method		
e	Experiences	-	-
1			
2			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Dej	pt:	IS Sem / Div: 3 / A Course: Transform Calculus, Fourier Series and Numerical Techniques		ive:		N
Dat	te:	18-09-2019 Time: 9:30 –11:00 C Code: 18MAT31	Max 1	Marks:	50	
_		Answer all full questions. All questions carry 25 marks.	ı			
	No	Questions	CO	Level	+	Module
1	a	Find the laplace transform of $(i)te^{(-4t)}\sin 3t(ii)\frac{(e^{(at)}-e^{(-at)})}{t}$	CO1	L3	6	1
	b	Express in terms of unit step function and hence find its laplace transform $f(t) = cost0 < t < \pi$ { $1\pi < t < 2\pi$ $sintt > 2\pi$	CO1	L3	6	1
	c	Solve by using laplace transforms $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ and $y(0) = y'(0) = 0$	CO2	L3	6	1
		If a periodic function of period $2a$ is defined by $f(t) = tif 0 < t < a $ $\{2a - tif a < t < 2a$ then show that $L[f(t)] = (\frac{1}{s^2}) \tanh(\frac{as}{2})$	CO1	L4	7	1
2	a	Find the inverse laplace transform of $\frac{(4s+5)}{((s-1)^2(s+2))}$	CO2	L3	6	1
		Find $L^{-1} \frac{1}{((s+1)(s^2+9))}$ using Convolution Theorem.	CO2	L3	6	1
	c	Solve $y'' + 6y' + 9y = 12t^2e^{-3t}$ by laplace transforms method with $y(0) = 0 = y'(0)$	CO2	L3	6	1
	d	If a periodic function of period $\frac{(2\pi)}{w}$ is defined by $f(t) =$	CO1	L4	7	1
		$Esinwtif 0 < t < \frac{\pi}{w}$ $\{ 0if \frac{\pi}{w} < t < \frac{(2\pi)}{w} \text{ then show that } L[f(t)] = \frac{Ew}{(s^2 + w^2)(1 - e^{(\frac{-as}{w})})}$				
3	a	Use Taylor's method to find y at $x = 0.1, 0.2, 0.3$ of the problem $\frac{dy}{dx} = x^2 + \frac{1}{2}$	CO7	L3	9	4
	b	y^2 with $y(0) = 1$. Consider upto 3^{rd} degree terms. Using Euler's modified method, solve for y at $x = 0.1$ if $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$. Carry out three modifications.	CO7	L3	8	4
	c	Apply Runge Kutta method of order four compute $y = 0.2$ given $10 \frac{dy}{dx} = x^2 + 10 \frac{dy}{dx}$	CO7	L3	8	4
		y^2 with $y(0) = 1$ taking h=0.2				
		OR				
4	a	Solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ find y at $x = 0.2$ using RK method taking h=0.2	CO7	L3	9	4
	b	Given $\frac{dy}{dx} = xy + y^2$ with $y(0) = 1, y(0.1) = 1.1169, y(0.2) =$	CO8	L3	8	4
		1.2773, $y(0.3) = 1.5049$ find $y(0.4)$ correct to three decimal places using Milne's method.				

Given $\frac{dy}{dx} = (1+y)x^2$ and $y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.233$	CO8	L3	8	4	
1.548, $y(1.3) = 1.979$ find $y(1.4)$ by Adams-Bashforth method					

b. Assignment -1

Note: A d	istinct assignment to be assigned to each student.			
Crs Code	Model Assignment Questions : 18MAT31 Sem: 3 Marks: 10/10 Time: 90	0 – 120 m	ninutes	
Course:	Transform Calculus, Fourier Series and Numerical	0 – 120 11	iniutes	
	Techniques			
	ch student to answer 2-3 assignments. Each assignment carries equal mark.	3.5		
SNo	USN Assignment Description	Marks 6	CO ₁	Level L3
1	Find the laplace transform of $(i)te^{(-4t)}\sin 3t(ii)\frac{(e^{(at)}-e^{(-at)})}{t}$			
2	Express in terms of unit step function and hence find its laplace $cost0 < t < \pi$	6	CO1	L3
	transform $f(t) = \{ 1\pi < t < 2\pi \}$ $sintt > 2\pi$			
3	Solve by using laplace transforms $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ and	6	CO2	L3
	y(0) = y'(0) = 0			
4	If a periodic function of period $2a$ is defined by $f(t) = tif 0 < t < a $ $\{2a - tif a < t < 2a^{then show that} L[f(t)] = (\frac{1}{s^2}) \tanh(\frac{as}{2})\}$	7	CO1	L4
5	Find the inverse laplace transform of $\frac{(4s+5)}{((s-1)^2(s+2))}$	6	CO2	L3
6	Find $L^{-1} \frac{1}{((s+1)(s^2+9))}$ using Convolution Theorem.	6	CO2	L3
7	Solve $y'' + 6y' + 9y = 12t^2e^{-3t}$ by laplace transforms method with $y(0) = 0 = y'(0)$	6	CO2	L3
8	If a periodic function of period $\frac{(2\pi)}{w}$ is defined by $f(t) =$	7	CO1	L4
	Esinwtif $0 < t < \frac{\pi}{w}$ $\begin{cases} 0if \frac{\pi}{w} < t < \frac{(2\pi)}{w} \text{ then show that} \end{cases}$ $L[f(t)] = \frac{Ew}{(s^2 + w^2)(1 - e^{(\frac{-as}{w})})}$			
9	Use Taylor's method to find y at $x = 0.1, 0.2, 0.3$ of the problem $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 1$. Consider upto 3 rd degree terms.	9	CO7	L3
10	Using Euler's modified method, solve for y at $x = 0.1$ if $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$. Carry out three modifications.	8	CO7	L3
11	Apply Runge Kutta method of order four compute $y = 0.2$ given $10 \frac{dy}{dx} = x^2 + y^2$ with $y(0) = 1$ taking h=0.2	8	CO7	L3
12	Solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ find y at $x = 0.2$ using RK method taking h=0.2	9	CO7	L3
13	Given $\frac{dy}{dx} = xy + y^2$ with $y(0) = 1, y(0.1) = 1.1169, y(0.2) = 1.2773, y(0.3) =$	8	CO8	L3
14	1.5049 find $y(0.4)$ correct to three decimal places using Milne's method. Given $\frac{dy}{dx} = (1+y)x^2$ and $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) =$	8	CO8	L3

1.979 find y(1.4) by Adams-Bashforth method

D2. TEACHING PLAN - 2

Module – 5

Title:	Numerical solution of second order	ODE's and	Calculus of	variations	Appr Time:	10 Hrs
a	Course Outcomes				_	Blooms
-	The student should be able to:				-	Level
1	Use appropriate multi-step numeric	al methods t	o solve seco	ond order ordinary differential	CO9	L3
	equations arising in flow data desig					
2	Analyze how to apply the Euler's e	equations for	a given fun	ction by Euler's equation	CO10	L4
b b	Course Schedule				-	
Class No		ODE DI	7 41 1		CO	Level
2	Numerical Solution of second ord Problems on RK method	er ODE-RK	method		CO9	L3 L3
3	Numerical Solution of second ord	er ODE-Mi	lne's metho	od	CO9	L3
4	Problems on Milne's Method	1	1.1	XI	CO9	L3
5	Calculus of variation: Basic defin	itions and p	roblems on	Variation of functional	CO10	L4
6	Problems on functionals				CO10	L4
7	Derivation of Euler's equation				CO10	L4
8	Applications of Calculus of Variation				CO10	L4
9	Problems on Geodesic and Ha	anging cha	in		CO10	L4
10	Additional problems				CO10	L4
c	Application Areas				CO	Level
1	To solve first order and second order	r ODE usin	g single step	numerical methods	CO9	L3
2	To determine extremal functions analysis in the field of civil enginee		lynamics of	f rigid bodies and vibrational	CO10	L4
d	Review Questions					
1		d^2v	dy a		CO9	L3
1	By Runge Kutta method solve					
2	decimal places using the initia				CO10	L4
2	$\int_0^{\frac{\pi}{2}} (y'^2 - y^2 + 2xy) dx$ On what extremum.	t curves can b	be the function	nal $y(0) = 0$, $y(\frac{\pi}{2}) = 0$ be	2010	
3	State and prove Euler's equation.				CO10	L4
4	Apply Milne's Method to compute following table of initial values.	y(0.4)give	n the equation	on $y'' + y' = 2e^x$ and the	CO9	L3
	x 0 0.1	0.2	0.3			
	y 2 2.01	2.04	2.09			
	y' 0 0.2	0.4	0.6			
5	Find the function y which makes th	e integral	$x^{2}(1+xy)$	$(x^2 + xy^2) dx$ an extremum	CO10	L4
6	Prove that the shortest distance be joining them.				CO10	L4
	Johnny them.					
e	Experiences				_	_
e	Experiences				-	-

Module - 2

Title:	Fourier Series	Appr	10 Hrs
		Time:	
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Analyze expansion of Fourier series using Euler formula	CO3	L3
2	Apply Fourier expansion in practical harmonic problems	CO4	L4
b	Course Schedule		
Class No		CO	Level
1	Periodic functions, Dirichlet's conditions	CO3	L3
2	Fourier series of periodic functions of period 360	CO3	L3
3	Fourier series of periodic functions of arbitrary period 2c	CO3	L3
4	Fourier series of even and odd	CO3	L3
	functions		
5	Solving numericals	CO3	L3
6	half range cosine Fourier series	CO3	L3
7	half range sine Fourier series	CO3	L3
8	Practical harmonic analysis	CO4	L3
9	Solving numericals	CO4	L3
10	Solving numericals	CO4	L3
		GO	
1	Application Areas To study the nature of wave forms in voltage- current characteristics.	CO ₃	Level L3
2	Used to convert to discrete time domain signal into discrete frequency domain signal.	CO3	L3
	Osci to convert to discrete time domain signar into discrete frequency domain signar.	CO4	LS
d	Review Questions	_	_
1	Find the fourier series for the function $f(x) = x(2\pi - x)$ over the interval $(0,2\pi)$ and hence	CO3	L3
	deduce that $\frac{\pi^2}{12} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ If $f(x) = \begin{cases} x0 < x < \frac{\pi}{2} \\ \pi - x \frac{\pi}{2} < x < \pi \end{cases}$ Show that $f(x) = \frac{4}{\pi} \left[sinx - \frac{sin3x}{3^2} + \frac{1}{\pi} \right]$		
	deduce that $\frac{1}{12} - L_{n=1}$ $\frac{n^2}{n}$	G 6 6	
2	$x0 < x < \frac{\pi}{2}$	CO3	L3
	If $f(x) = \{ \frac{\pi}{\pi} x = \frac{\pi}{3^2} \}$ Show that $f(x) = \frac{\pi}{\pi} \sin x - \frac{\pi}{3^2} \sin x = \frac{\pi}{3^2}$		
	$\left[\frac{\sin 5x}{5^2} - \dots\right]$		
3	The following table gives variations of periodic current over a period T. Show that there is a direct	CO4	L4
	current part of 0.75amp in the variable current and obtain the amplitude of first harmonic		
	t(sec) 0 T/6 T/3 T/2 2T/3 5T/6 T		
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		
	100 12 105 12 000 025 100		
	A(amp) 1.98 1.3 1.05 1.3 -0.88 -0.25 1.98		
		602	
4	Find the fourier series of the function $\frac{2}{3} = x^{2} + \frac{1}{3} = \frac{1}{3}$	CO3	L3
	$f(x) = \begin{cases} 2 - x0 \le x \le 4 \\ x - 64 \le x \le 8 \end{cases}$ and hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$		
5	Find the half range cosine series for the function $f(x) = (x-1)^2$ in $0 < x < 1$	CO3	L3
6	Compute the constant term and first two harmonic of the function of $f(x)$ given by	CO4	L4
	compare the constant term and most two marmonic of the function of j (w)given by		
	х 0 П 2П П 4П 5П 2П		
	$\left \begin{array}{c cccccccccccccccccccccccccccccccccc$		
	f(x) 1.0 1.4 1.9 1.7 1.5 1.2 1.0		
e	Experiences	-	-
1			
2			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Dept:	:	IS	Sem / Div:	3 / A		Course:		and Nume		rier Electi	ve:		N
Date:		24-10-19	Time:	9:30-		C Code:	18MAT	Γ31		Max N	Aarks:		50
		nswer all ful	l questions.	All que			arks						
QNo					Ques					CO	Level	Marks	Module
1 8	a	Find the fourion (0.2π) and b	er series for the	the function that $\frac{\pi^2}{1}$	$on f(x) = \sum_{n=1}^{\infty}$	$) = x(2)$ $\frac{(-1)}{2}$	$(\pi - \chi)^n$	over the in	terval	CO3	L3	9	2
ł		$(0,2\pi)$ and f If $f(x) = \{\frac{\sin 5x}{5^2} - \dots$			Show to π	that $f(x)$	$=\frac{4}{\pi}[si$	$\sin x - \frac{\sin x}{2}$	$\frac{n3x}{3^2} +$	CO3	L3	8	2
(The following is a direct currifirst harmonic	rent part of 0								L4	8	2
		t(sec)	0	T/6	T/3	T/2	2T/3	5T/6	Т				
		A(amp)	1.98	1.3	1.05	1.3	-0.88	-0.25	1.98				
						R							
2 2		Find the four $f(x) = \begin{cases} 2 - x \\ x - x \end{cases}$				uce that $\frac{\pi}{3}$	$\frac{r^2}{8} = \frac{1}{1^2} +$	$\frac{1}{3^2} + \frac{1}{5^2} +$	·	CO3	L3	8	2
ŀ	b	Find the half $0 < x < 1$	range cosi							CO3	L3	8	2
(Compute the $f(x)$ given b		erm and	first two	harmoni	c of the f	unction o	f	CO4	L4	9	2
		X	0	$\frac{\Pi}{3}$	$\frac{2\Pi}{3}$	П	$\frac{4\Pi}{3}$	$\frac{5\Pi}{3}$	2Π				
		f(x)	1.0	1.4	1.9	1.7	1.5	1.2	1.0				
3 8		By Runge	4 decimal		un	и	A			CO9	L3	8	5
		y' = 0whe	en x = 0										
ł		$\int_{0}^{\frac{\pi}{2}} (y'^{2} - y)^{2}$ $0, y(\frac{\pi}{2}) = 0$			what cur	ves can be	the funct	ional $y(0)$) =	CO10	L4	8	5
(State and pro				R				CO10	L4	9	5

4	la		oply Milne's and the fol		-	-	en the equati	on $y'' + y' =$	CO9	L3	9	5
			X	0	0.1	0.2	0.3					
			у	2	2.01	2.04	2.09					
			y'	0	0.2	0.4	0.6					
								J				
	b	Fir	nd the functi		ch makes	the integra	$\int_{x_1}^{x_2} (1+x)^{-1}$	$(xy' + xy'^2) dx$ an	CO10	L4	8	5
	С		ove that the aight line joi		istance be	tween two	points in a	plane is along the	CO10	L4	8	5

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

								del Assign	ment (Questi	ions				
Crs Co	ode:	18MAT31	S	em:		3		Marks:		10/ 1	0 Tir	ne:	90 – 120 n	ninutes	
Course	7	Technique	s.					and Nun							
			nsv	ver 2-3 a	assig	nme					equal mar	k.		1	
SNo	U	SN						signment		_			Marks	CO	Level
1			COI	rrect to	4 d	ecii	nal p	laces usi	0000		$(\frac{dy}{dx})^2 - y^2$		2 8	CO9	L3
2			π					x = 0					8	CO10	L4
2			U	$(y'^2 - y(\frac{\pi}{2}) =$					curves	can b	e the functio	nal $y(0)$:	=	COTO	L
3			Sta	te and p	rove	Eule	er's eq	uation.					9	CO10	L4
4						the f		compute \mathfrak{z} ng table o		l valu	n the equation the equation the equation of th	on y" +	9	CO9	L3
				y y'			0	2.01	2.0		2.09	_			
5			Fin					hich mak emum	es the	e int	egral $\int_{x_1}^{x_2}$	(1+xy')	+ 8	CO10	L4
6					the s	hort	est dis	tance bety	ween to	wo po	oints in a p	lane is aloi	ng 8	CO10	L4
7			Fine	d the four	rier so 2π	eries and l	for the	function <i>f</i> leduce that	$\frac{\pi^2}{12} = \frac{1}{12}$	$\sum_{n=1}^{\infty}$	$(2\pi - x)_0$	+1 —	9	CO3	L3
8			If f	$\frac{f(x) = \frac{3x}{2} + \frac{\sin^2 x}{2}}{\frac{\sin^2 x}{2}} + \frac{\sin^2 x}{2}$	$\{\pi$	x0 – x	$< x < \frac{\pi}{2} < 1$	$<\frac{\pi}{2}$ $x < \pi$	ow that	f(x)	$= \frac{4}{\pi} [sir$	ıx –	8	CO3	L3
9			The that	followin	ig tab a dire	le gi	ves var irrent p	riations of p art of 0.75a			nt over a per riable curren			CO4	L4

	t(sec)	0	T/6	T/3	T/2	2T/3	5T/6	T				
	A(amp	1.98	1.3	1.05	1.3	-0.88	0.25	1.98				
10	Find the fou	rier ser	ies of the	e functio	n		2			8	CO3	L3
	$f(x) = \begin{cases} 2 - x \\ x - x \end{cases}$		$\begin{array}{c} x \le 4 \\ x \le 8 \end{array}$	and her	nce de	duce tl	nat $\frac{\pi^2}{8}$	$=\frac{1}{1^2}+\frac{1}{3}$	<u>+</u>			
11	Find the hal		cosine se	eries for	the fund	ction $f(z)$	x) = ($(x-1)^{\frac{1}{2}}$	² in	8	CO3	L3
	0 < x < 1	L										
12	Compute the	e consta	int term	and first	two har	monic of	f the fun	ction of		9	CO4	L4
	f(x)given	by										
									,			
	X	0	<u>П</u>	2Π	П	$\frac{4\Pi}{}$	<u>5Π</u>	2Π				
			3	3		3	3					
	f(x)	1.0	1.4	1.9	1.7	1.5	1.2	1.0				

D3. TEACHING PLAN - 3

Module - 3

Title:	Fourier transform; Difference equations and z-transforms	Appr Time:	10 Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Apply to transform form one to another domain by fourier intergrals	CO5	L3
2	Apply to transform one domain to another domain by z-transforms	CO6	L3
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Infinite fourier transform	CO5	L3
2	Fourier sine transform	CO5	L3
3	Fourier cosine transform	CO5	L3
4	Basic definition, Z-transforms definition	CO5	L3
5	Standard Z-transforms, damping rule	CO5	L3
6	Shifiting rule, initial value and final value theorems	CO5	L3
7	Solving numerical	CO5	L3
8	Inverse Z-transform	CO6	L3
9	Numericals	CO6	L3
10	Applications to solve difference equations	CO6	L3
c	Application Areas	CO	Level
1	To study the continuous and Apply to transform one domain to another domain by z-transforms discrete signals and its properties.	CO5	L3
2	Used to convert to discrete time domain signal into discrete frequency domain signal.	CO6	L3
d	Review Questions	-	-
1	Find the complex fourier transform of the function $f(x) = \begin{cases} 1 & \text{for } x \le a \\ 0 & \text{for } x > a \end{cases}$ hence deduce $\int_0^\infty \frac{\sin x}{x} dx$	CO9	L3
2	Find the complex fourier transform of the function $f(x) = \begin{cases} xfor x \le \alpha \\ 0for x > \alpha \end{cases}$ where α is a positive constant.	CO9	L3

Find the complex fourier transform of the function $f(x) = \{\begin{array}{c} 0for x > 1 \\ 0for x > 1 \end{array}$ hence deduce $\int_0^\infty \frac{\sin^2 t}{t^2} dt = \frac{\pi}{2}$ 5 If $f(x) = \{1 - x^2 for x < 1 \\ 0for x \ge 1 \}$ find the fourier transform of $f(x)$ and hence deduce $\int_0^\infty \frac{x\cos x - \sin x}{x^2} \cos(\frac{x}{2}) dx$ 6 Find the fourier sine and cosine transform of $f(x) = e^{-ax}$ CO9 L3 7 Find the fourier sine transform of $f(x) = e^{- x }$ and hence evaluate $\int_0^\infty \frac{x\sin nx}{1+x^2} dx$, $m > 0$ CO9 L3 8 Find the inverse fourier sine transform of $f_s(a) = \frac{e^{-aa}}{a}$, $a > 0$ CO9 L3 9 Find the Z transforms of the following: $(i)e^{-an}$; $(ii)e^{-an}$; $(iii)e^{-an}$. n^2 CO10 L3 10 Find the Z transform of $2n + \sin(\frac{n\pi}{4}) + 1$ CO10 L3 11 Show that $Z_T(\frac{1}{n}) = e^{\frac{1}{2}}$. Hence find $Z_T(\frac{1}{(n+1)!})$ and $Z_T(\frac{1}{(n+2)!})$ CO10 L3 12 Find the Z transform of $\sin(3n+5)$ CO10 L3 13 Find the Z transform of $n\cos n\theta$ CO10 L3 14 Find $Z_T(\frac{1}{(n+1)})$ CO10 L3 15 If $\tilde{u}(z) = \frac{2z^2 + 3z + 4}{(z-3)^3}$, $ z > 3$ CO10 L3 Show that $u_1 = 2, u_2 = 21, u_3 = 139$ CO10 L3 16 Given $Z_T(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}$, $ z > 3$ CO10 L3 17 Find the inverse Z transform of $\frac{3z^2 + 2z}{(z-1)(z-2)}$ CO10 L3 18 Find the inverse Z transform of $\frac{3z^2 + 2z}{(z^3 - 1)(z-2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n CO10 L3 e Experiences	3	Find the fourier transform of $f(x) = e^{- x }$	CO9	L3
	4	Find the complex fourier transform of the function $f(x) = \begin{cases} 1 - x for x \le 1 \\ 0 for x > 1 \end{cases}$ hence	CO9	L3
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		deduce $\int_0^\infty \frac{\sin^2 t}{t^2} dt = \frac{\pi}{2}$		
Find the fourier sine transform of $f(x) = e^{- x }$ and hence evaluate $\int_0^\infty \frac{x \sin x}{1+x^2} dx$, $m > 0$ CO9 L3 8 Find the inverse fourier sine transform of $\hat{f}_s(\alpha) = \frac{e^{-a\alpha}}{\alpha}$, $a > 0$ CO9 L3 9 Find the Z transforms of the following: $(i)e^{-an}$; $(ii)e^{-an}$, $(iii)e^{-an}$. n^2 CO10 L3 10 Find the Z transform of $2n + \sin(\frac{n\pi}{4}) + 1$ CO10 L3 11 Show that $Z_T(\frac{1}{n!}) = e^{\frac{1}{z}}$. Hence find $Z_T(\frac{1}{(n+1)!})$ and $Z_T(\frac{1}{(n+2)!})$ CO10 L3 12 Find the Z transform of $\sin(3n+5)$ CO10 L3 13 Find the Z transform of $n\cos n\theta$ CO10 L3 14 Find $Z_T(\frac{1}{(n+1)})$ CO10 L3 15 If $\tilde{u}(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3 CO10 L3 16 Given $Z_T(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}$, $ z > 3$ CO10 L3 Show that $u_1 = 2, u_2 = 21, u_3 = 139$ CO10 L3 17 Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$ CO10 L3 18 Find the inverse Z transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n CO10 L3 e Experiences	5	If $f(x) = \begin{cases} 1 - x^2 for x < 1 \\ 0 for x \ge 1 \end{cases}$ find the fourier transform of $f(x)$ and hence deduce	CO9	L3
Find the fourier sine transform of $f(x) = e^{- x }$ and hence evaluate $\int_0^\infty \frac{x \sin x}{1+x^2} dx$, $m > 0$ CO9 L3 8 Find the inverse fourier sine transform of $\hat{f}_s(\alpha) = \frac{e^{-a\alpha}}{\alpha}$, $a > 0$ CO9 L3 9 Find the Z transforms of the following: $(i)e^{-an}$; $(ii)e^{-an}$, $(iii)e^{-an}$. n^2 CO10 L3 10 Find the Z transform of $2n + \sin(\frac{n\pi}{4}) + 1$ CO10 L3 11 Show that $Z_T(\frac{1}{n!}) = e^{\frac{1}{z}}$. Hence find $Z_T(\frac{1}{(n+1)!})$ and $Z_T(\frac{1}{(n+2)!})$ CO10 L3 12 Find the Z transform of $\sin(3n+5)$ CO10 L3 13 Find the Z transform of $n\cos n\theta$ CO10 L3 14 Find $Z_T(\frac{1}{(n+1)})$ CO10 L3 15 If $\tilde{u}(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3 CO10 L3 16 Given $Z_T(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}$, $ z > 3$ CO10 L3 Show that $u_1 = 2, u_2 = 21, u_3 = 139$ CO10 L3 17 Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$ CO10 L3 18 Find the inverse Z transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n CO10 L3 e Experiences		$\int_0^\infty \frac{x \cos x - \sin x}{x^3} \cos(\frac{x}{2}) dx$		
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9 Find the Z transforms of the following: $(i)e^{-an}$; $(ii)e^{-an}$ n; $(iii)e^{-an}$. n^2 CO10 L3 10 Find the Z transform of $2n + \sin(\frac{n\pi}{4}) + 1$ CO10 L3 11 Show that $Z_T(\frac{1}{n!}) = e^{\frac{1}{z}}$. Hence find $Z_T(\frac{1}{(n+1)!})$ and $Z_T(\frac{1}{(n+2)!})$ CO10 L3 12 Find the Z transform of $\sin(3n+5)$ CO10 L3 13 Find the Z transform of $n\cos n\theta$ CO10 L3 14 Find $Z_T(\frac{1}{(n+1)})$ CO10 L3 15 If $u(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3 CO10 L3 16 Given $Z_T(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}$, $ z > 3$ CO10 L3 Show that $u_1 = 2, u_2 = 21, u_3 = 139$ CO10 L3 17 Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$ CO10 L3 18 Find the inverse Z transform of $\frac{3z^2 + 2z}{(z-1)(z-2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n CO10 L3	7	Find the fourier sine transform of $f(x) = e^{- x }$ and hence evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2} dx$, $m > 0$	CO9	L3
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	8	Find the inverse fourier sine transform of $f_s(\alpha) = \frac{e^{-a\alpha}}{\alpha}$, $\alpha > 0$		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	9		CO10	L3
12 Find the Z transform of $sin(3n + 5)$ CO10 L3 13 Find the Z transform of $ncosnθ$ CO10 L3 14 Find $Z_T(\frac{1}{(n+1)})$ CO10 L3 15 If $\bar{u}(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3 CO10 L3 16 Given $Z_T(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}$, $ z > 3$ CO10 L3 Show that $u_1 = 2, u_2 = 21, u_3 = 139$ CO10 L3 17 Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$ CO10 L3 18 Find the inverse Z transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n CO10 L3	10	Find the Z transform of $2n + \sin(\frac{n\pi}{4}) + 1$	CO10	L3
13 Find the Z transform of $ncosnθ$ CO10 L3 14 Find $Z_T(\frac{1}{(n+1)})$ CO10 L3 15 If $\bar{u}(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3 CO10 L3 16 Given $Z_T(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}, z > 3$ CO10 L3 Show that $u_1 = 2, u_2 = 21, u_3 = 139$ CO10 L3 17 Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$ CO10 L3 18 Find the inverse Z transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n CO10 L3 e Experiences	11	Show that $Z_T(\frac{1}{n!}) = e^{\frac{1}{z}}$. Hence find $Z_T(\frac{1}{(n+1)!})$ and $Z_T(\frac{1}{(n+2)!})$	CO10	L3
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	12	Find the Z transform of $sin(3n + 5)$	CO10	L3
15 If $\bar{u}(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3 CO10 L3 16 Given $Z_T(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}$, $ z > 3$ CO10 L3 Show that $u_1 = 2, u_2 = 21, u_3 = 139$ CO10 L3 17 Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$ CO10 L3 18 Find the inverse Z transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n CO10 L3 e Experiences	13	Find the Z transform of $ncosn\theta$	CO10	L3
$16 Given Z_T(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}, z > 3$ $Show that u_1 = 2, u_2 = 21, u_3 = 139$ $17 Find the inverse Z transform of \frac{z}{(z-1)(z-2)}$ $18 Find the inverse Z transform of \frac{3z^2 + 2z}{(5z-1)(5z+2)}$ $19 Given U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)} find u_n$ $CO10 L3$ $e Experiences$	14	Find $Z_T(\frac{1}{(n+1)})$	CO10	L3
Show that $u_1 = 2, u_2 = 21, u_3 = 139$ 17 Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$ CO10 L3 18 Find the inverse Z transform of $\frac{3z^2+2z}{(5z-1)(5z+2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2-2z}{(z^3-5z^2+8z-4)}$ find u_n CO10 L3 e Experiences	15	If $\bar{u}(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3	CO10	L3
Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$ CO10 L3 18 Find the inverse Z transform of $\frac{3z^2+2z}{(5z-1)(5z+2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2-2z}{(z^3-5z^2+8z-4)}$ find u_n CO10 L3 e Experiences	16	(Z 3)	CO10	L3
Find the inverse Z transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n CO10 L3 e Experiences		Show that $u_1 = 2$, $u_2 = 21$, $u_3 = 139$		
Find the inverse Z transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$ CO10 L3 19 Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n CO10 L3 e Experiences	17	Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$	CO10	L3
Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n e Experiences CO10 L3	18	Find the inverse Z transform of $\frac{3z^2+2z}{(5z-1)(5z+2)}$	CO10	L3
	19	Given $U(z) = \frac{4z^2 - 2z}{(z^3 - 5z^2 + 8z - 4)}$ find u_n	CO10	L3
		Expariances		
	1	Experiences	-	-

E3. CIA EXAM – 3

a. Model Question Paper - 3

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

1010.	1 distinct t	ussigninci	it to be assig	neu to caen si	iddent.						
				Model	Assignment	Questions					
Crs Code: 18MAT31 Sem: 3 Marks: 10/10 Time: 90) – 120 m	ninutes			
Course	e: Trai	nsform C	alculus, Fou	rier series ar	nd Numerica						
		hniques.									
Note:			ver 2-3 assig	nments. Each	assignment	carries equa	al mark.				
SNo	USN				nment Desci				Marks	CO	Level
1			d the cor				function $f(x)$		6	CO9	L3
-							runetion) (x	,	Ü	00)	
		$\{0,1\}$	$ \alpha = \alpha_{\rm W}$	here αis a po	sitive constar	ıt.					
2								7	CO9	L3	
3	Find the complex fourier transform of the function $f(x) =$					() =	7	CO9	L3		
		{1	- x for x $0for x >$	$ \stackrel{\leq}{\leq} 1 $ hence de	duce $\int_0^\infty \frac{\sin \theta}{\theta}$	$\frac{n^2t}{2}dt = \frac{\pi}{2}$					
4		Fin	d the inverse	e Z transform	of $\frac{z}{(z-1)(z-2)}$				6	CO10	L3
5		Fin	d the inverse	e Z transform	of $\frac{3z^2+2z}{(5z-1)(5z+2)}$?)			7	CO10	L3
6		Giv	$Ven U(z) = \frac{1}{2}$	$4z^2-2z$ (z^3-5z^2+8z-4)	\overline{u}_n				7	CO10	L3
7		If j	$f(x) = \begin{cases} 1 - x \\ 0 \end{cases}$	$ x^2 for x < 0$ $ x \le 1$	1 find the fo	ourier trans	sform of $f(x)$	and	6	CO9	L3
									1		I

	hence deduce $\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos(\frac{x}{2}) dx$			
8	Find the fourier sine and cosine transform of $f(x) = e^{-\alpha x}$	7	CO9	L3
9	Find the fourier sine transform of $f(x) = e^{- x }$ and hence evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2} dx, m > 0$	7	CO9	L3
10	Find the Z transforms of the following: $(i)e^{-an}$; $(ii)e^{-an}n$; $(iii)e^{-an}$. n^2	6	CO10	L3
11	Find the Z transform of $2n + \sin(\frac{n\pi}{4}) + 1$	7	CO10	L3
12	Show that $Z_T(\frac{1}{n!}) = e^{\frac{1}{z}}$. Hence find $Z_T(\frac{1}{(n+1)!})$ and $Z_T(\frac{1}{(n+2)!})$	7	CO10	L3
13	Find the Z transform of $sin(3n + 5)$	6	CO10	L3
14	Find the Z transform of $ncosn\theta$	7	CO10	L3
15	Find $Z_T(\frac{1}{(n+1)})$	7	CO10	L3

F. EXAM PREPARATION

1. University Model Question Paper

Course:		Transform Calculus Fourier Series and Numerical Techniques Month /	Year	May /2	019
Crs C		18MAT31 Sem: 3 Marks: 100 Time:		180 mi	
-		Answer any FIVE full questions. All questions carry equal marks.	Marks	CO	Level
1	a	Find the laplace transform of $(i)te^{(-4t)}\sin 3t(ii)\frac{(e^{(at)}-e^{(-at)})}{t}$	6	CO1	L3
	b	Express in terms of unit step function and hence find its laplace transform $f(t)=cost0 < t < \pi$ { $1\pi < t < 2\pi$ $sintt > 2\pi$	7	CO1	L3
	С	If a periodic function of period $2a$ is defined by $f(t) = tif 0 < t < a $ $\{2a - tif a < t < 2a^{then show that } L[f(t)] = (\frac{1}{s^2}) tanh(\frac{as}{2}) \}$	7	CO1	L3
2		OR		CO2	1.2
2	a	Find the inverse laplace transform of $\frac{(4s+5)}{((s-1)^2(s+2))}$	6	CO2	L3
	b	Find $L^{-1} \frac{1}{((s+1)(s^2+9))}$ using Convolution Theorem.	7	CO2	L3
	c	Solve $y'' + 6y' + 9y = 12t^2e^{-3t}$ by laplace transforms method with $y(0) = 0 = y'(0)$	7	CO2	L3
3	a	Find the fourier series for the function $f(x) = x(2\pi - x)$ over the interval $(0,2\pi)$ and hence deduce that $\frac{\pi^2}{12} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$	6	CO3	L3
	b	Find the fourier series for the function $f(x) = x(2\pi - x)$ over the interval $(0,2\pi)$ and hence deduce that $\frac{\pi^2}{12} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ If $f(x) = \{x = x = x < \pi \}$ Show that $f(x) = \frac{4}{\pi} [sinx - \frac{sin3x}{3^2} + \frac{sin5x}{5^2} - \dots]$	7	CO3	L3
	С	The following table gives variations of periodic current over a period T. Show that there is a direct current part of 0.75amp in the variable current and obtain the amplitude of first harmonic	7	CO4	L4
		t(sec) 0 T/6 T/3 T/2 2T/3 5T/6 T			
		A(amp) 1.98 1.3 1.05 1.3 -0.88 -0.25 1.98			
		OR		-	
4		Find the fourier series of the function	6	CO3	L3
		$f(x) = \begin{cases} 2 - x0 \le x \le 4 \\ x - 64 \le x \le 8 \end{cases}$ and hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$			
	b	Find the half range cosine series for the function $f(x) = (x-1)^2$ in $0 < x < 1$	7	CO3	L3

		1			
	c	Compute the constant term and first two harmonic of the function of $f(x)$ given by	7	CO4	L4
		$\begin{array}{ c c c c c c c c c c c c c c c c c c c$			
		f(x) 1.0 1.4 1.9 1.7 1.5 1.2 1.0			
5	a	Find the complex fourier transform of the function $f(x) = \begin{cases} 1 & \text{for } x \le a \\ 0 & \text{for } x > a \end{cases}$ hence	6	CO9	L3
		deduce $\int_0^\infty \frac{\sin x}{x} dx$		2010	
	b	Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$	7	CO10	L3
	c	If $\bar{u}(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3	7	CO10	L3
		OR			
6	a	If $f(x) = \begin{cases} 1 - x^2 for x < 1 \\ 0 for x \ge 1 \end{cases}$ find the fourier transform of $f(x)$ and hence deduce	6	CO9	L3
	h	$\int_0^\infty \frac{x \cos x - \sin x}{x^3} \cos(\frac{x}{2}) dx$	7	CO10	L3
	b c	Find the Z transform of $2n + \sin(\frac{n\pi}{4}) + 1$	7	CO10	L3
		Show that $Z_T(\frac{1}{n!}) = e^{\frac{1}{2}}$. Hence find $Z_T(\frac{1}{(n+1)!})$ and $Z_T(\frac{1}{(n+2)!})$		CO10	L3
7	a	dy 2	6	CO7	L3
,	u	Use Taylor's method to find y at $x = 0.1, 0.2, 0.3$ of the problem $\frac{dy}{dx} = x^2 + \frac{dy}{dx}$	Ü	007	23
	b	y^2 with $y(0) = 1$. Consider upto 3^{rd} degree terms.	7	CO7	L3
	U	Using Euler's modified method, solve for y at $x = 0.1$ if $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 0.1$,	CO7	LJ
		1. Carry out three modifications.		G00	
	С	Apply Runge Kutta method of order four compute $y = 0.2$ given $10 \frac{dy}{dx} = x^2 + 10 \frac{dy}{dx}$	7	CO8	L3
		y^2 with $y(0) = 1$ taking h=0.2			
8	a	$\frac{dy}{dx} = \frac{v^2 - v^2}{v^2 - v^2}$	6	CO8	L3
O	u	Solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ find y at $x = 0.2$ using RK method taking $h=0.2$	Ü	200	13
	b	Given $\frac{dy}{dx} = xy + y^2$ with $y(0) = 1$, $y(0.1) = 1.1169$, $y(0.2) = 1.1169$	7	CO8	L3
		1.2773, $y(0.3) = 1.5049$ find $y(0.4)$ correct to three decimal places using			
		Milne's method.		~~~	
	c	Given $\frac{dy}{dx} = (1+y)x^2$ and $y(1) = 1, y(1.1) = 1.233, y(1.2) =$	7	CO8	L3
		1.548, $y(1.3) = 1.979$ find $y(1.4)$ by Adams-Bashforth method			
9	a	By Runge Kutta method solve $\frac{d^2y}{dx^2} = x(\frac{dy}{dx})^2 - y^2$ for x=0.2 correct to	6	CO9	L3
		4 decimal places using the initial conditions $y = 1$ and $y' = 0$ when			
		x = 0			
	b	$\int_0^{\frac{\pi}{2}} (y'^2 - y^2 + 2xy) dx$ On what curves can be the functional $y(0) = 0$, $y(\frac{\pi}{2}) = 0$	7	CO10	L3
		Obe extremum.			
	c	State and prove Euler's equation. OR	7	CO10	L4
10	a	Apply Milne's Method to compute $y(0.4)$ given the equation $y'' + y' = 2e^x$ and	6	CO9	L3
		the following table of initial values.			
		x 0 0.1 0.2 0.3			
		1 1/2 012			

	У	2	2.01	2.04	2.09				
	y'	0	0.2	0.4	0.6				
Find the function y which makes the integral $\int_{x_1}^{x_2} (1 + xy' + xy'^2) dx$ an extremum									L3
	Prove that the s	7	CO10	L4					
	line joining the	m.							

2. SEE Important Questions

Cours		Transform Calculus, Fourier series and Numerical Techniques. Month	Year	May /2	
Crs C		18MAT31 Sem: 3 Marks: 100 Time:	1	180 mi	nutes
		Answer any FIVE full questions. All questions carry equal marks.	-	-	
Mod ule	Qno.	Important Question	Marks	CO	Year
1	1	Find the laplace transform of $(i)te^{(-4t)}\sin 3t(ii)\frac{(e^{(at)}-e^{(-at)})}{t}$	6	CO1	
	2	Express in terms of unit step function and hence find its laplace transform $f(t) = cost0 < t < \pi$ { $1\pi < t < 2\pi$ $sintt > 2\pi$	7	CO1	
	3	If a periodic function of period $2a$ is defined by $f(t) = tif 0 < t < a $ $\{2a - tif a < t < 2a^{then show that } L[f(t)] = (\frac{1}{s^2}) tanh(\frac{as}{2})\}$	7	CO1	
	4	Find the inverse laplace transform of $\frac{(4s+5)}{((s-1)^2(s+2))}$	6	CO2	
	5	Find $L^{-1} \frac{1}{((s+1)(s^2+9))}$ using Convolution Theorem.	7	CO2	
	6	Solve $y'' + 6y' + 9y = 12t^2e^{-3t}$ by laplace transforms method with $y(0) = 0 = y'(0)$	7	CO2	
2	1	Find the fourier series for the function $f(x) = x(2\pi - x)$ over the interval $(0,2\pi)$ and hence deduce that $\frac{\pi^2}{10} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$	6	CO3	
	2	hence deduce that $\frac{\pi^2}{12} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ If $f(x) = \begin{cases} x0 < x < \frac{\pi}{2} \\ \pi - x \frac{\pi}{2} < x < \pi \end{cases}$ Show that $f(x) = \frac{4}{\pi} [sinx - \frac{sin3x}{3^2} + \frac{sin5x}{5^2} - \dots]$	7	CO3	
	3	The following table gives variations of periodic current over a period T. Show that there is a direct current part of 0.75amp in the variable current and obtain the amplitude of first harmonic	7	CO4	
		t(sec) 0 T/6 T/3 T/2 2T/3 5T/6 T A(amp) 1.98 1.3 1.05 1.3 -0.88 -0.25 1.98			
		A(amp) 1.98 1.3 1.05 1.3 -0.88 -0.25 1.98			
	4	Find the fourier series of the function $f(x) = \begin{cases} 2 - x0 \le x \le 4 \\ x - 64 \le x \le 8 \end{cases}$ and hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$	6	CO3	
	5	Find the half range cosine series for the function $f(x) = (x-1)^2$ in $0 < x < 1$	7	CO3	
	6	Compute the constant term and first two harmonic of the function of $f(x)$ given by	7	CO4	

		x 0 $\frac{\Pi}{3}$ $\frac{2\Pi}{3}$ Π $\frac{4\Pi}{3}$ $\frac{5\Pi}{3}$ 2Π f(x) 1.0 1.4 1.9 1.7 1.5 1.2 1.0		
3	1	Find the complex fourier transform of the function $f(x) = \begin{cases} 1 & \text{for } x \leq a \\ 0 & \text{for } x > a \end{cases}$ hence	6	CO9
	2	deduce $\int_0^\infty \frac{\sin x}{x} dx$ If $f(x) = \begin{cases} 1 - x^2 for x < 1 \\ 0 for x \ge 1 \end{cases}$ find the fourier transform of $f(x)$ and hence deduce $\int_0^\infty \frac{x \cos x - \sin x}{x^3} \cos(\frac{x}{2}) dx$	7	CO9
	3	Find the inverse fourier sine transform of $f_s(\alpha) = \frac{e^{-a\alpha}}{\alpha}$, $\alpha > 0$	7	CO9
	4	Find $Z_T(\frac{1}{(n+1)})$	6	CO10
	5		7	CO10
	6	Find the inverse Z transform of $\frac{3z^2+2z}{(5z-1)(5z+2)}$ Given $U(z) = \frac{4z^2-2z}{(z^3-5z^2+8z-4)}$ find u_n	7	C010
		Given $U(z) = \frac{1}{(z^3 - 5z^2 + 8z - 4)}$ find u_n		
4	1	Use Taylor's method to find y at $x = 0.1, 0.2, 0.3$ of the problem $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 1$. Consider upto 3^{rd} degree terms.	6	CO7
	2	Using Euler's modified method, solve for y at $x = 0.1$ if $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 0.1$	7	CO7
	3	1. Carry out three modifications. Apply Runge Kutta method of order four compute $y = 0.2$ given $10 \frac{dy}{dx} = x^2 + x^2$ with $x(0) = 1$ taking by 0.2	7	CO8
	4	y^2 with $y(0) = 1$ taking h=0.2 Solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ find y at $x = 0.2$ using RK method taking h=0.2	6	CO8
	5	Given $\frac{dy}{dx} = xy + y^2$ with $y(0) = 1$, $y(0.1) = 1.1169$, $y(0.2) = 1.2773$, $y(0.3) = 1.5049$ find $y(0.4)$ correct to three decimal places using Milne's method.	7	CO8
	6	Given $\frac{dy}{dx} = (1+y)x^2$ and $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) = 1.979$ find $y(1.4)$ by Adams-Bashforth method	7	CO8
5	1	By Runge Kutta method solve $\frac{d^2y}{dx^2} = x(\frac{dy}{dx})^2 - y^2$ for x=0.2 correct to 4 decimal places using the initial conditions $y = 1$ and $y' = 0$ when $y = 0$	6	CO9
	2	$x = 0$ $\int_0^{\frac{\pi}{2}} (y'^2 - y^2 + 2xy) dx$ On what curves can be the functional $y(0) = 0$, $y(\frac{\pi}{2}) = 0$.	7	CO10
	3	Obe extremum. State and prove Euler's equation.	7	CO10
	4	Apply Milne's Method to compute $y(0.4)$ given the equation $y'' + y' = 2e^x$ and the following table of initial values.	6	CO9
		x 0 0.1 0.2 0.3		
		y 2 2.01 2.04 2.09		
		y' 0 0.2 0.4 0.6		
	5	Find the function y which makes the integral $\int_{x_1}^{x_2} (1 + xy' + xy'^2) dx$ an extremum	7	CO10

Prove that the shortest distance between two points in a plane is along the straight 7 CO10 line joining them.

G. Content to Course Outcomes

1. TLPA Parameters

Table 1: TLPA - Example Course

Mo	Course Content or Syllabus	Content	Blooms'	Final	Identified	Instructio	Assessment
dul	(Split module content into 2 parts which have	Teaching	Learning	Bloo	Action	n	Methods to
e-#	similar concepts)	Hours	Levels for	ms'	Verbs for	Methods	Measure
			Content	Level	Learning	for	Learning
						Learning	
\boldsymbol{A}	В	\boldsymbol{C}	D	E	F	G	H
	Laplace transforms of elementary functions.Laplace		L3	L3	Apply	Lecture	Assinments
	transforms of periodic functions and unit step						and Slip test
	functions.						
1	Inverse laplace transforms, convolution theorem to	5	L3	L3	Apply	Lecture	Assinments
	find the inverse laplace transforms and						and Slip test
	problems. Solution of linear differential equations						
	using Laplace transform.						
	Fourier series of 2∏,21 period & half range fourier	6	L3	L3	Apply	Lecture	Assinments
	series						and Slip test
2	Practical Harmonic analysis.	4	L4	L4	Analyze	Lecture	Assinments
							and Slip test
	Infinite Fourier transforms, fourier sine and cosine	4	L3	L3	Apply	Lecture	Assinments
	transforms & Fourier inverse transforms						and Slip test
3	Z-transforms and inverse z-transforms	6	L3	L3	Apply	Lecture	Assinments
							and Slip test
	Numerical Solutions of ODE of first order and	5	L3	L3	Apply	Lecture	Assinments
	degree-Taylor's Method, Modified Euler's Equations						and Slip test
4	RK method, Milne's and Adams Bashforth method	5	L3	L3	Apply	Lecture	Assinments
							and Slip test
	Numerical Solutions of second order ODE using	7	L3	L3	Apply	Lecture	Assinments
	Runge-Kutta method and Milne's Method.						and Slip test
	Variational problems, euler's equations, geodesics	3	L4	L4	Analyze	Lecture	Assinments
	and problems						and Slip test

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Example Course

Mo	Learning or	Identified	Final Concept	Concept Justification	CO Components	Course Outcome
dul	Outcome from	Concepts		(What all Learning	(1.Action Verb,	
e-#	study of the	from		Happened from the	2.Knowledge,	
	Content or	Content		study of Content /	3.Condition /	Student Should be
	Syllabus			Syllabus. A short word	Methodology,	able to
				for learning or	4.Benchmark)	
				outcome)		
\boldsymbol{A}	I	J	K	L	M	N
1	Solution of DE	Laplace	Differential	Methods to solve	Apply	Use laplace transform
	using laplace	transformat	Equations	differential equations	Differentiation	in solving Differential
	transforms	ion		using laplace	Problem Solving	equations arising in
				transformation		network analysis,
						control systems and
						other fields of
						engineering.
1	Solution of DE	Laplace	Differential		Apply	Use inverse laplace
	using laplace	transformat	Equations	differential educations	Differentiation	transform in solving
	and inverse	ion		using laplace	Problem Solving	Differential/ integral
	laplace			transformation		equations arising in

	transforms					network analysis, control systems and other fields of engineering.
	using fourier expansion	Fourier series	Analyze circuits&syste m communication	Methods to solve DE using fourier series expansion	Apply Integration Problem Solving	Analyze expansion of Fourier series using Euler formula
2	Solution of DE using fourier expansion	Analysis	Analyze circuits&syste m communication	Methods to solve partical harmonic problem over a period using fourier expansion	Apply Problem Solving	Apply Fourier expansion in practical harmonic problems
3	Solution of DE using fourier transforms		Continuous signal process	Methods to solve differential equations using fourier transformation	Apply Integration Problem Solving	Apply to transform form one to another domain by Fourier integrals
3	Solution of DE using Z and inverse Z transforms	Laplace transformat ion	Discrete signal process	Methods to solve differential equations using Z and inverse Z transformation	Apply Integration Problem Solving	Apply to transform one domain to another domain by z-transforms
4	Numerical Methods to solve DE	Differential Equations	Ordinary Differential Equations.	Methods to solve DE using Numerical Methods	Apply Differentiation Problem Solving	Use appropriate single step numerical methods to solve first order ordinary differential equations.
	Methods to solve DE	•	Differential Equations.	using Numerical Methods	Apply Differentiation Problem Solving	Use appropriate multi- step numerical methods to solve first order ordinary differential equations arising in flow data design problems.
5	Numerical Methods to solve DE		Ordinary Differential Equations.	Methods to solve DE using Numerical Methods	Apply Differentiation Problem Solving	Use appropriate multi- step numerical methods to solve second order ordinary differential equations arising in flow data design problems.
5	Applications of Calculus of Variations	Extremum	Maximum and minimum	Calculus of variations	Apply Differentiation Problem Solving	Analyze how to apply the Euler's equations for a given function by Euler's equation