Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – May / June 2026

Date: 22-05-2026 **Time:** 09:30am – 12:30pm

School: SOE	**Program**: B.Tech.	
Course Code: MAT2302	**Course Name:** Transform Techniques, Partial differential Equations and Complex variables	
Semester: II	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	10	14	14	12	24	26

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. 10Q x 2M = 20M

1	Define periodic function with an example.	2 Marks	L2	CO2
2	Find whether the function $f(x) = \|x\|\ in\ (-\pi, \pi)$ is even or odd.	2 Marks	L2	CO2
3	Write linearity property for Fourier transform.	2 Marks	L1	CO3
4	Define inverse Fourier transform of a function $\bar{f}(s)$.	2 Marks	L1	CO3
5	Define Damping rule of Z-transform.	2 Marks	L1	CO4
6	Define homogeneous PDE with an example	2 Marks	L2	CO5
7	Define one-dimensional heat equation.	2 Marks	L1	CO5
8	Define an analytic function of complex variable.	2 Marks	L1	CO6
9	Write Cauchy's Reimann equations in polar form.	2 Marks	L1	CO6
10	Define a conformal transformation.	2 Marks	L1	CO6

Part B

Answer the Questions. Total Marks 80M

11	Apply the concept of Laplace transform to solve the equation	10 Marks	L3	CO1

	$\frac{dy}{dt} + y = t\,e^{-t}$ with $y(0) = 2$.			
	Or			
12	Apply convolution theorem to find inverse Laplace transform of $\frac{1}{s(s^2+4)}$.	10 Marks	L3	CO1

13	Find half range Fourier sine series of $f(x) = x$ in $(0, \pi)$.	10 Marks	L3	CO2
	Or			
14	Find the Fourier series of $f(x)$ in $(0,2\pi)$ up to second harmonic for the following data. x: 0, $\pi/3$, $2\pi/3$, π, $4\pi/3$, $5\pi/3$, 2π $f(x)$: 1, 1.4, 1.9, 1.7, 1.5, 1.2, 1	10 Marks	L3	CO2

15	Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2, & \lvert x\rvert \le a \\ 0, & \lvert x\rvert > a \end{cases}$ and hence deduce that $\int_0^\infty \frac{sint - tcost}{t^3} dt = \frac{\pi}{4}$.	10 Marks	L3	CO3
	Or			
16	Find Fourier cosine transform of $f(x) = x^2\ for\ \ 0 < x < 2$.	10 Marks	L3	CO3

17	a	Find the Z transform of $e^n\ sin3n$.	4 Marks	L3	CO4
	b	Find the inverse Z transform of $U(z) = \frac{Z^2 - 3Z}{(Z-5)(Z+1)}$.	6 Marks	L3	CO4
		Or			
18		Solve by Z transform method $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$ with $u_0 = 0\ and\ u_1 = 1$.	10 Marks	L3	CO4

19	a	Apply the method of partial differentiation to eliminate the arbitrary constants a and b, and hence form the corresponding partial differential equation from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.	5 Marks	L3	CO5
	b	Apply the method of partial differentiation to eliminate the arbitrary function and hence form the corresponding partial differential equation for the equation $z = f(x^2 + y^2)$	5 Marks	L3	CO5
		Or			
20		Solve: $\frac{\partial^2 z}{\partial y^2} = z$, given that $y = 0, z = e^x and\ \frac{\partial z}{\partial y} = e^{-x}$.	10 Marks	L3	CO5

21	Solve: $\frac{\partial^2 z}{\partial x \partial y} = \frac{x}{y} + a$, given $\frac{\partial z}{\partial x} = x$ when y=1 and z=0 when x=0.	10 Marks	L3	CO5
	Or			
22	Solve the PDE: $xp - yq = y^2 - x^2$.	10 Marks	L3	CO5

23	Derive Cauchy's Reimann equation in cartesian form.	10 Marks	L3	CO6
	Or			
24	Show that the function u= $x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic and find its harmonic conjugate. Also find the corresponding analytic function $f(z)$.	10 Marks	L3	CO6

25	Demonstrate the conformal transformation for $w = e^z$.	10 Marks	L3	CO6
	Or			
26	Evaluate $\int_C \frac{e^{3z}}{(Z+2)(Z-1)} dz$,where C is the circle $\lvert Z\rvert = 3$.	10 Marks	L3	CO6