Register No : ____________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

UG/PG DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2026

Third Semester

Common to all Branches

MA3351/UMAT24301 - TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

Regulations – 2021/2024

Duration : 3 Hrs ***Maximum : 100 Marks***

PART – A(ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BLT	CO	Marks
1.	Find the complete integral of $\sqrt{p}+\sqrt{q}=1$.	L1	1	2
2.	Find the particular integral of $(D^2-2DD'+D'^2)z=\cos(x-3y)$.	L2	1	2
3.	Find the Fourier constants b_n for $x\sin x$ in $(-\pi,\pi)$.	L2	2	2
4.	Define Dirichlet's condition in Fourier series.	L2	2	2
5.	Write the possible solution in wave equation.	L1	3	2
6.	Classify the partial differential equation $u_{xx}+2u_{xy}+u_{yy}=0$.	L1	3	2
7.	Define Fourier Transform pair.	L1	4	2
8.	Prove that $F_s[f(ax)]=\frac{1}{a}F_s\left[\frac{s}{a}\right]$.	L2	4	2
9.	Find $Z\left[\frac{1}{n}\right]$.	L2	5	2
10.	State the Initial and Final value theorem.	L1	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No			Questions	BLT	CO	Marks
11.	a	i	Solve $z=px+qy+\sqrt{1+p^2+q^2}$.	L3	1	8
		ii	Find the general solution of $px^2+qy^2=z^2$.	L3	1	8
			Or			
	b	i	Form the p.d.e by eliminating f and ϕ from $z=f(y)+\phi(x+y+z)$.	L3	1	8
		ii	Solve $(D^3-7DD'^2-6D'^3)z=\sin(x+2y)+e^{3x+y}$.	L3	1	8
12.	a		Obtain Fourier series for $f(x)$ of period $2l$ and defined as follows $f(x)=\begin{cases} l-x, & 0<x\le l \\ 0, & l\le x<2l \end{cases}$. Hence deduce that $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\cdots=\frac{\pi}{4}$ and $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots=\frac{\pi^2}{8}$.	L3	2	16
			Or			
	b	i	Find the Half range sine series for $f(x)=x(\pi-x)$ in $(0,\pi)$.	L3	2	8
		ii	Compute the first two harmonics of Fourier cosine series of $f(x)$ given by the following data.	L3	2	8

x	0	$\pi/3$	$2\pi/3$	π	$4\pi/3$	$5\pi/3$	2π
y	1.8	0.3	0.5	2.16	1.3	1.76	1.8

13.	a		A string is stretched and fastened to two points $x = 0$ and $x = l$ apart. Motion is started by displacing the string into the form $y = k(lx - x^2)$ from which it is released at time $t = 0$. Find the displacement of any point on the string at a distance of x from one end at time t.	L3	3	16
			Or			
	b		A rod 30 cm long has its ends A and B kept at 20° and 80° respectively until steady state conditions prevail. The temperature at each end is then suddenly reduced to 0°C and kept so. Find the resulting temperature function $u(x,t)$ taking $x = 0$ at A.	L3	3	16
14.	a	i	Show that the Fourier Transform of $e^{\frac{-x^2}{2}}$ is $e^{\frac{-s^2}{2}}$	L3	4	8
		ii	Evaluate $\int_0^{\infty} \frac{dx}{(x^2+1)(x^2+4)}$	L3	4	8
			Or			
	b		Show that the Fourier transform of $f(x) = \begin{cases} a^2 - x^2, & \lvert x\rvert < a \\ 0, & \lvert x\rvert > a > 0 \end{cases}$ is $2\sqrt{\frac{2}{\pi}}\left(\frac{\sin as - as\cos as}{s^3}\right)$. Hence, deduce that $\int_0^{\infty} \frac{\sin t - t\cos t}{t^3}\,dt = \frac{\pi}{4}$. Using Parseval's identity show that $\int_0^{\infty}\left(\frac{\sin t - t\cos t}{t^3}\right)^2 dt = \frac{\pi}{15}$.	L3	4	16
15.	a	i	Using convolution theorem evaluate inverse Z-transform of $\left[\frac{z^2}{(z-1)(z-3)}\right]$.	L3	5	10
		ii	Find $Z[\cos n\theta]$ and $Z[\sin n\theta]$.	L3	5	6
			Or			
	b		Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ given $y_0 = y_1 = 0$.	L3	5	16

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