Gandhi Institute of Engineering and Technology University, Odisha, Gunupur

(GIET UNIVERSITY)

M.Sc. (Third Semester – Regular) Examinations, December – 2025

24MPCMA23004 – Integral Transform

(Mathematics)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

		CO #	Blooms Level
Q.1.	Answer ***ALL*** questions		
a.	Find inverse Laplace transforms of $\frac{2s-5}{4s^2+25}+\frac{4s-18}{9-s^2}$	CO1	K2
b.	Write the application of Fourier Series.	CO2	K1
c.	Obtain inverse Fourier cosine transform, $F_c(\frac{1}{1+x^2})$	CO3	K2
d.	Define the Z transform and Inverse of Z transform of a function.	CO4	K1
e.	Write inverse formula of Hankel transform	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

	Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a.	Solve $\int_0^\infty te^{-t}\sin^4 t\,dt$.	5	CO1	K2
b.	State and prove Convolution theorem.	5	CO1	K3
	(OR)			
c.	State and prove Tauberian theorem.	5	CO1	K2
d.	Find inverse Laplace transforms of $\frac{1+2s}{(s+2)^2(s-1)^2}$	5	CO1	K3
3.a.	Find the Fourier series of a function $f(x)=\begin{cases}-x, & -\pi<x<0\\ x, & 0<x<\pi\end{cases}$	5	CO2	K2
b.	Derive the Fourier series and its coefficient.	5	CO2	K3
	(OR)			
c.	State and prove Parseval theorem on Laplace Transform.	5	CO2	K3
d.	Find the Fourier series of a function $f(x)=x^2,[0,2\pi]$	5	CO2	K2
4.a.	Prove that $Z(n^p)=-z\frac{d}{dz}(n^{p-1})$	5	CO3	K2
b.	Find the inverse Z-transform of $\frac{2z^2+3z}{(z+2)(z+4)}$	5	CO3	K3
	(OR)			
c.	Find the Z-transformation of n^2a^n	5	CO3	K2
d.	Find the inverse Z-transform of $\frac{10z}{(z-1)(z-2)}$	5	CO3	K3
5.a.	Find Fourier transform of, $e^{-ax^2}, a>0$	5	CO4	K2

b.	Find Fourier transform $f(x) = \begin{cases} \lvert x \rvert, & -1 < x < 1 \\ 0\ , & otherwise \end{cases}$	5	CO4	k3
	(OR)			
c.	Find Fourier transform $f(x) = \begin{cases} e^{x}, & if\ x < 0 \\ e^{-x}\ , & if\ x > 0 \end{cases}$	5	CO4	K2
d.	Stare and prove convolution theorem on Fourier Transformation.	5	CO4	K3
6.a.	Find the Hankel transform of, $f(x) = \begin{cases} x^{n}, & 0 < x < a \\ 0\ , & x > a \end{cases}$, n>-a	5	CO5	K2
b.	State and prove Parseval's theorem.	5	CO5	k3
	(OR)			
c.	State and prove Hankel transform of 1st derivative of a function.	10	CO5	k3

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Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
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M.Sc. (Third Semester – Regular/ Supplementary) Examinations, December – 2025

Sub. Code –

Sub. Name : Integral Transform

(MSc Mathematics)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	Prove that $\int_0^\infty \frac{e^{-t}-e^{-3t}}{t}dt = log3$.	CO1	K2
b.	Show that $\{1+x, x-x^2\}$ are orthogonal on $[-2,2]$.	CO2	K1
c.	Prove that $z(n) = \frac{z}{(z-1)^2}$	CO3	K2
d.	Find cosine Fourier transform $f(x) = e^{-ax}$,	CO4	K1
e.	Define Hankel transform with example.	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	Solve by using Laplace transformation $f(t) = \begin{cases} t^2, & 0<t<2 \\ t-1, & 2<t<3 \\ 7, & t>3 \end{cases}$	5	CO1	K2
b.	Solve $L^{-1}\left\{\frac{1}{(s^2+4)(s^2+1)}\right\}$ by using Convolution method.	5	CO1	K3
	(OR)			
c.	Solve $y'' - 2y' - 3y = 1, y(0) = 1, y'(0) = 0$.	5	CO1	K2
d.	State and prove Tauberian theorem.	5	CO1	K3
3.a.	Find the Fourier series of a function $f(x) = e^{ax}, [-\pi, \pi]$?	5	CO2	K2
b.	Show that $\{1, cosx, sinx, cos2x, sin2x, \ldots\ldots\ldots\}$ from an orthogonal set on $-\pi$ to π.	5	CO2	K3
	(OR)			
c.	Find the Fourier series of a function $f(x) = x^2,\ 0 < x < 2$?	5	CO2	K3
d.	Derive the Fourier series and Fourier Coefficent.	5	CO2	K2
4.a.	Find the Z-transformation of ne^{an}	5	CO3	K2
b.	Find the inverse Z-transform of $\frac{10z}{(z-1)(z-2)}$	5	CO3	K3
	(OR)			
c.	Prove that $Z(n^p) = -z\, d/dz(n^{p-1})$	5	CO3	K2
d.	Find the Z transform of $(z^2+z) / (z-1)^3$	5	CO3	K3

5.a.	Find Fourier cosine transform of, $f(x) = \begin{cases} 1, & 0 < x < 1 \\ -1, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$	5	CO4	K2
b.	Stare and prove convolution theorem on Fourier Transformation.	5	CO4	K2
	(OR)			
c.	Find Fourier transform $f(x) = \begin{cases} \lvert x \rvert, & -1 < x < 1 \\ 0, & otherwise \end{cases}$	5	CO4	K2
d.	Find Fourier transform $f(x) = \begin{cases} x^2, & if\ 0 < x < 1 \\ 0, & o/w \end{cases}$	5	CO4	K2
6.a.	State and prove Hankel transform of 1st derivative of a function.	10	CO5	K3
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	(OR)			
c.	Find the Hankel transform of, $f(x) = \begin{cases} a^2 - x^2, & 0 < x < a \\ 0, & x > a \end{cases}$	5	CO5	K2
d.	Find the Hankel transform of $\frac{e^{-ax}}{x}$	5	CO5	K2

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