

Reg.No. _____

**Karunya UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

Code : 14MA2003
Sub. Name : Mathematical Transforms

Semester : 2016-17 ODD
Duration : 3hrs
Max. marks : 100

Q. No.	Questions	Course outcome	Marks
PART-A (40X1=40 MULTIPLE CHOICE QUESTIONS)			
1.	$L\{\sinh at\} = \text{-----}$	CO1	
	a. $\frac{a}{s^2 - a^2}$ b. $\frac{s}{s^2 - a^2}$ c. $\frac{a}{s^2 + a^2}$ d. $\frac{s}{s^2 + a^2}$		(1)
2.	$L\{e^{-at} \cos bt\} = \text{-----}$	CO1	
	a. $\frac{s+a}{(s+a)^2 + b^2}$ b. $\frac{s+a}{(s+a)^2 - b^2}$ c. $\frac{s-a}{(s-a)^2 - b^2}$ d. $\frac{s-a}{(s-a)^2 + b^2}$		(1)
3.	$L\{e^{-5t}\} = \text{-----}$	CO1	
	a. $\frac{1}{s-5}$ b. $\frac{1}{s+5}$ c. $\frac{s}{s+5}$ d. $\frac{s}{s-5}$		(1)
4.	$L\{\cos 4t\} = \text{-----}$	CO1	
	a. $\frac{s}{s^2 - 16}$ b. $\frac{4}{s^2 + 16}$ c. $\frac{s}{s^2 + 16}$ d. $\frac{4}{s^2 - 16}$		(1)
5.	$L\{t^n f(t)\} = \text{-----}$	CO1	
	a. $(-1) \frac{d}{ds}(L\{f(t)\})$ b. $\frac{d^n}{ds^n}(L\{f(t)\})$ c. $(-1)^n \frac{d^n}{ds^n}(L\{f(t)\})$ d. $(-1)^2 \frac{d^2}{ds^2}(L\{f(t)\})$		(1)
6.	If $L\{f(t)\} = \bar{f}(s)$ then $L\left\{\int_0^t \int_0^t f(t) dt\right\} = \text{-----}$	CO1	
	a. $\int_s^\infty \bar{f}(s) ds$ b. $\frac{\bar{f}(s)}{s^3}$ c. $\frac{\bar{f}(s)}{s}$ d. $\frac{\bar{f}(s)}{s^2}$		(1)
7.	Evaluate $\int_0^\infty e^{-3t} \cdot \sin t dt$	CO1	
	a. $\frac{1}{10}$ b. $\frac{3}{10}$ c. $\frac{2}{10}$ d. $\frac{3}{50}$		(1)
8.	$L\{t\} = \text{-----}$	CO1	
	a. $\frac{1}{s^2}$ b. $-\frac{1}{s^2}$ c. $\frac{1}{s^3}$ d. $\frac{1}{s}$		(1)
9.	$L^{-1}\left\{\frac{1}{s^n}\right\}$	CO1	
	a. $\frac{t^n}{n!}$ b. $\frac{t^{n-1}}{(n-1)!}$ c. $\frac{t^{n-1}}{(n+1)!}$ d. $\frac{t^{n+1}}{(n+1)!}$		(1)

10.	$L^{-1}(s^2 \bar{f}(s))$ -----				CO1	
	a. $\frac{d^2}{dt^2} f(t)$	b. $\frac{d}{ds} \bar{f}(s)$	c. $\frac{d^2}{ds^2} \bar{f}(s)$	d. $\frac{d}{dt} f(t)$		(1)
11.	$L^{-1}\left(\int_s^\infty \bar{f}(s)ds\right)$ -----				CO1	
	a. $t f(t)$	b. $\frac{f(t)}{t}$	c. $\frac{f(t)}{t^2}$	d. $f(t+a)$		(1)
12.	$L^{-1}(\bar{f}(s).\bar{g}(s))$ -----				CO1	
	a. $\int_0^\infty f(u)g(t-u)du$	b. $\int_{-\infty}^\infty f(u)g(t-u)du$	c. $\int_0^t f(u)g(t-u)du$	d. $\int_\infty^t f(u)g(t-u)du$		(1)
13.	$L^{-1}\left(\frac{s}{s^2-a^2}\right)$ -----				CO1	
	a. $\sin at$	b. $\cos at$	c. $\sinh at$	d. $\cosh at$		(1)
14.	$L^{-1}\left(\frac{s-3}{(s-3)^2+9}\right)$ -----				CO1	
	a. $e^{3t} \sin t$	b. $e^{-3t} \sin t$	c. $e^{-3t} \cos 3t$	d. $e^{3t} \cos 3t$		(1)
15.	$L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$ is				CO1	
	a. $t \cos at$	b. $\frac{t \cos at}{2a}$	c. $\frac{t \sin at}{2a}$	d. $t \sin at$		(1)
16.	$L^{-1}\left(\frac{1}{(s-a)^2+b^2}\right)$ is				CO1	
	a. $\frac{e^{at} \cos bt}{b}$	b. $\frac{e^{at} \sin bt}{b}$	c. $\frac{e^{at} \sin bt}{a}$	d. $\frac{e^{-at} \sin bt}{b}$		(1)
17.	The Fourier transform of $f(x)$ is				CO2	
	a. $\int_0^\infty f(x)e^{-isx} dx$	b. $\int_{-\infty}^\infty f(x)e^{isx} dx$	c. $\int_{-\infty}^\infty f(x)e^{-isx} dx$	d. $\int_0^\infty f(x)e^{isx} dx$		(1)
18.	The Fourier cosine transform of $f(x)$, $F_c(s) =$ -----				CO2	
	a. $\int_0^\infty f(x) \cos sxdx$	b. $\int_{-\infty}^\infty f(x) \cos sxdx$	c. $\int_0^\infty f(x) \cos xdx$	d. $\int_{-\infty}^\infty f(x) \cos xdx$		(1)
19.	The FFST of $f(x)$ in $(0, l)$ is, $F_s(n) =$ -----				CO2	
	a. $\int_0^l f(x) \sin n\pi x dx$	b. $\int_0^\infty f(x) \sin \frac{n\pi x}{l} dx$	c. $\int_0^l f(x) \sin \frac{n\pi x}{l} dx$	d. $\int_{-l}^l f(x) \sin \frac{n\pi x}{l} dx$		(1)
20.	$F(f(ax))$ is				CO2	
	a. $\frac{1}{a} F\left(\frac{s}{a}\right)$	b. $F\left(\frac{s}{a}\right)$	c. $a F\left(\frac{s}{a}\right)$	d. $F\left(\frac{s}{a}\right)$		(1)
21.	$F(f(x-a))$ is -----				CO2	
	a. $F\left(\frac{s}{a}\right)$	b. $e^{-isa} F(s)$	c. $e^{isa} F(s)$	d. $e^{sa} F(s)$		(1)
22.	The convolution of two functions $f(x)$ and $g(x)$ is $f(x)*g(x) =$ -----				CO2	

	a. $\int_{-\infty}^{\infty} f(u)g(xu)du$	b. $\int_{-\infty}^0 f(u)g(x-u)du$	c. $\int_{-\infty}^{\infty} f(u)g(x-u)du$	d. $\int_0^{\infty} f(u)g(x-u)du$		(1)
23.	$\frac{1}{2\pi} \int_{-\infty}^{\infty} F(s)G(s)ds = \text{-----}$				CO2	
	a. $\int_{-\infty}^{\infty} f(x)g(x)dx$	b. $\int_0^{\infty} f(x)g(x)dx$	c. $\int_{-\infty}^{\infty} f(x)dx$	d. $\int_{-\infty}^{\infty} g(x)dx$		(1)
24.	The inverse Fourier cosine transform of $F_c(s)$ is $f(x) = \text{-----}$				CO2	
	a. $\frac{1}{\pi} \int_0^{\infty} F_c(s) \cos sxdx$	b. $\frac{2}{\pi} \int_0^{\infty} F_c(s) \cos sxdx$	c. $\frac{2}{\pi} \int_{-\infty}^{\infty} F_c(s) \cos sxdx$	d. $\frac{1}{\pi} \int_{-\infty}^{\infty} F_c(s) \cos sxdx$		(1)
25.	$Z\{2^n\} = \text{-----}$				CO3	
	a. $\frac{z}{z-2}$	b. $\frac{z}{z+2}$	c. $\frac{2}{z-2}$	d. $\frac{2}{z+2}$		(1)
26.	$Z\{t\} = \text{-----}$				CO3	
	a. $\frac{Tz}{(z-1)^2}$	b. $\frac{z}{(z-1)^2}$	c. $\frac{Tz}{(z-1)}$	d. $\frac{Tz}{(z-1)^3}$		(1)
27.	$Z\left\{4^n \sin \frac{n\pi}{2}\right\}$ is				CO3	
	a. $\frac{4z}{z^2-16}$	b. $\frac{4z}{z^2+16}$	c. $\frac{4}{z^2+16}$	d. $\frac{z}{z^2+16}$		(1)
28.	$Z\{3^n.n\} = \text{-----}$				CO3	
	a. $\frac{3z}{(z+3)}$	b. $\frac{3z}{(z-3)}$	c. $\frac{3z}{(z+3)^2}$	d. $\frac{3z}{(z-3)^2}$		(1)
29.	$Z\{e^{3t}\} = \text{-----}$				CO3	
	a. $\frac{z}{z-e^{-3T}}$	b. $\frac{z}{z+e^{3T}}$	c. $\frac{z}{z-e^{3t}}$	d. $\frac{z}{z-e^{3T}}$		(1)
30.	$Z\left\{\cos \frac{n\pi}{2}\right\} = \text{-----}$				CO3	
	a. $\frac{z^2}{z^2-1}$	b. $\frac{z^2}{z^2+1}$	c. $\frac{z}{z+1}$	d. $\frac{z}{z-1}$		(1)
31.	$Z\{e^{at+b}\} = \text{-----}$				CO3	
	a. $e^b \frac{z}{z-e^{aT}}$	b. $e^b \frac{z}{z+e^{aT}}$	c. $\frac{z}{z-e^{aT}}$	d. $e^b \frac{z}{z-e^{-aT}}$		(1)
32.	$Z\{n\} = \text{-----}$				CO3	
	a. $\frac{z}{(z+1)^2}$	b. $\frac{z}{(z-1)^2}$	c. $\frac{z}{(z-1)}$	d. $\frac{z}{(z+1)}$		(1)
33.	$Z^{-1}\left(\frac{1}{z+a}\right) = \text{-----}$				CO3	
	a. $(-a)^n$	b. a^n	c. $(-a)^{n-1}$	d. a^{n-1}		(1)
34.	$Z^{-1}\left(\frac{z}{z-a}\right) = \text{-----}$				CO3	
	a. $(-a)^n$	b. a^{n-1}	c. a^n	d. $(-a)^{n-1}$		(1)

35.	$Z^{-1}\left(\frac{az}{(z-a)^2}\right) = \text{-----}$				CO3	
	a. na^n	b. $(-a)^n$	c. a^{n-1}	d. $(-a)^{n-1}$		(1)
36.	$Z^{-1}\left(\frac{1}{(z-a)^2}\right) = \text{-----}$				CO3	
	a. $(n+1)a^{n-2}$	b. $(n-1)a^{n-1}$	c. $(n+1)a^{n+2}$	d. $(n-1)a^{n-2}$		(1)
37.	$Z^{-1}\left(\frac{1}{z-3}\right) = \text{-----}$				CO3	
	a. $(-3)^n$	b. 3^n	c. 3^{n-1}	d. 3^{n+1}		(1)
38.	$Z^{-1}\left(\frac{z}{z+5}\right) = \text{-----}$				CO3	
	a. 5^n	b. $(-5)^n$	c. $(-5)^{n+1}$	d. $5n$		(1)
39.	$Z^{-1}\left(\frac{1}{(z-a)^3}\right) = \text{-----}$				CO3	
	a. $\frac{1}{2}(n+1)(n+2)a^{n-3}$	b. $\frac{1}{2}(n+1)(n+2)a^{n+3}$	c. $\frac{1}{2}(n-1)(n-2)a^{n-3}$	d. $\frac{1}{2}(n-1)(n-2)a^{n+3}$		(1)
40.	$Z^{-1}\left(\frac{z}{z-1}\right) =$				CO3	
	a. 1	b. -1	c. -n	d. n		(1)

PART B(8 X 5 = 40 MARKS) (ANSWER ANY EIGHT)

41.	Find $L\{t^2 e^{-t} \cos t\}$.	CO1	(5)
42.	Evaluate $\int_0^\infty \frac{e^{-t} - e^{-3t}}{t} dt$ using Laplace Transform.	CO1	(5)
43.	Find $L^{-1}\left\{\frac{s+2}{s^2-4s+13}\right\}$	CO1	(5)
44.	Using convolution theorem find inverse Laplace transform of $\frac{1}{(s+a)(s+b)}$	CO1	(5)
45.	Find the finite fourier cosine transform of $f(x) = x^2$ in $(0, l)$	CO2	(5)
46.	Using Parseval's identity, prove that $\int_0^\infty \frac{dt}{(a^2+t^2)(b^2+t^2)} = \frac{\pi}{2ab(a+b)}$	CO2	(5)
47.	Find $Z\left\{\cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)\right\}$	CO3	(5)
48.	Derive $Z\{a^n \sin n\omega\}$	CO3	(5)
49.	Using partial fraction, find $Z^{-1}\left\{\frac{z}{(z-1)(z-2)}\right\}$	CO3	(5)
50.	Find the inverse Z transform of $\frac{z(z-3)}{(z+2)(z-5)}$ using residue method.	CO3	(5)

PART C(2 X 10 = 20 MARKS) (ANSWER ANY TWO)

51.	Solve the differential equation $\frac{d^2 y}{dt^2} - 3\frac{dy}{dt} + 2y = e^{3t}$, given $y(0) = 0, y'(0) = 0$.	CO1	(10)
-----	---	-----	------

52.	Find the Fourier transform of $f(x) = 1 - x^2$, $ x \leq 1$ $= 0$, $ x > 1$	CO2	(10)
53.	Solve the difference equation $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$, given $y_0 = y_1 = 0$.	CO3	(10)

ALL THE BEST