

Reg. No. : **E N G G T R E E . C O M****Question Paper Code : 30070**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

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Second Semester

Electrical and Computer Engineering

MA25C03 — TRANSFORMS AND ITS APPLICATIONS

(Common to Electrical and Electronics Engineering/Electronics and Instrumentation Engineering/Instrumentation and Control Engineering)

(Regulations 2025)

Time : 3 hours

Maximum : 100 marks

CO – Course Outcomes

CO1	Explain the concept of various transform functions in engineering applications.
CO2	Apply Laplace and inverse Laplace transforms for solving differential equations.
CO3	Apply Z-transform methods to solve problems and analyze the results.
CO4	Apply Fourier series to express functions and analyze the convergence behavior of the series
CO5	Select and apply appropriate software for applying transform functions.

BL – Bloom's Taxonomy Levels

(L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create)

Answer ALL questions.

PART – A (Total Marks = 40)**[Q. No. 1 to Q. No. 10 ; $10 \times 1 = 10$ Marks (Multiple Choice Questions)]****Q. No. 11 to Q. No. 20; $10 \times 3 = 30$ Marks]**

Q.No.	Questions	Marks	CO	BL
1.	The Laplace transform of $t^2 e^{-3t}$ is (A) $\frac{2}{(s+3)^3}$ (B) $\frac{2}{(s-3)^3}$ (C) $\frac{1}{(s+3)^2}$ (D) $\frac{6}{(s+3)^2}$	1	1, 2	1

2.	The inverse Laplace transform of $\frac{1}{s^2+9}$ is (A) $\cos 3t$ (B) $\frac{1}{3}\sin 3t$ (C) $\sin 3t$ (D) $3\sin 3t$	1	1, 2	2
3.	The Z-transform of the sequence $\{2^n\}$ is (A) $\frac{z}{z-2}$ (B) $\frac{z}{2-z}$ (C) $\frac{1}{z-2}$ (D) $\frac{z^2}{z-2}$	1	1, 3	1
4.	The inverse Z-transform of $\frac{z}{z-1}$ is (A) n (B) 1 (C) $n+1$ (D) 2^n	1	1, 3	2
5.	For an odd function, the Fourier series contains only (A) cosine terms (B) constant term (C) sine terms (D) exponential terms	1	1, 4	1
6.	The Fourier coefficient a_0 represents (A) Amplitude (B) Average value of the function (C) Period (D) Frequency	1	1, 4	2
7.	Parseval's identity relates (A) Derivatives and integrals (B) Fourier coefficients and square integrals (C) Laplace and Fourier transforms (D) Convolution and transforms	1	1, 4	1
8.	The Fourier transform of $\delta(t-a)$ is (A) $e^{-i\omega a}$ (B) $e^{i\omega a}$ (C) $\cos \omega a$ (D) $\sin \omega a$	1	1, 5	2
9.	The convolution theorem is associated with (A) Matrix algebra (B) Fourier and Laplace transforms (C) Vector spaces (D) Probability theory	1	1, 5	1

10.	The Fourier transform of an even function is generally (A) Purely imaginary and odd (B) Real and even (C) Odd and real (D) Periodic	1	1, 5	2
11.	Find $L\{t^2 \sin 3t\}$.	3	1, 2	1
12.	Obtain the inverse Laplace transform of $\frac{2s+5}{(s-1)(s+2)}$.	3	1, 2	2
13.	Using convolution theorem, evaluate $L^{-1}\left\{\frac{1}{s^2(s^2+4)}\right\}$.	3	1, 2	1
14.	Find the Z-transform of the sequence $\{n2^n\}$.	3	1, 3	2
15.	Obtain the inverse Z-transform of $\frac{z(z+1)}{(z-2)^2}$.	3	1, 3	1
16.	Expand $f(x)=x^2, 0 < x < \pi$ as a half-range sine series.	3	1, 4	2
17.	Determine the Fourier coefficients of $f(x)=x, -\pi < x < \pi$.	3	1, 4	1
18.	Verify Parseval's identity for $f(x)=x, -\pi < x < \pi$.	3	1, 4	2
19.	Find the Fourier transform of $e^{-ax}, a > 0$.	3	1, 5	1
20.	Obtain the inverse Fourier transform of $\frac{1}{1+\omega^2}$.	3	1, 5	2

PART B — (5 × 12 = 60 marks)

Q.No.		Questions	Marks	CO	BL
21.	(a)	Solve using Laplace transform : $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 13y = 0, y(0)=2, y'(0)=1$.	12	1, 2	3
		OR			
	(b)	Find the inverse Laplace transform of $\frac{2s^3 + 5s^2 + 3s + 7}{s(s-1)(s^2+4)}$ using partial fractions.	12	1, 2	3

22.	(a)	Using convolution theorem, evaluate $L^{-1}\left\{\frac{1}{s^3(s^2+9)}\right\}$.	12	1, 2	4
	OR				
	(b)	Using Laplace transform, solve $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = te^{2t}$, $y(0)=1$, $y'(0)=0$.	12	1, 2	4
23.	(a)	Find the inverse Z-transform of the functions : $X(z) = \frac{z^2(3z-2)}{(z-1)^2(2z-1)}$.	12	1, 3	5
	OR				
	(b)	Using Z-transform, solve $y_{n+2} - 4y_{n+1} + 4y_n = n$, $y_0 = 2$, $y_1 = 3$.	12	1, 3	5
24.	(a)	Obtain the Fourier series of $f(x)=x^2$, $-\pi < x < \pi$ and hence deduce the value of $\sum_{n=1}^{\infty} \frac{1}{n^2}$.	12	1, 4	4
	OR				
	(b)	Expand $f(x)=x(\pi-x)$, $0 < x < \pi$, as a half-range cosine series.	12	1, 4	4
25.	(a)	Find the complex Fourier transform of $f(x)=e^{-a x }$, $a>0$ and hence evaluate the inverse transform.	12	1, 5	6
	OR				
	(b)	Using Fourier transform, solve the one-dimensional heat equation $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$, $-\infty < x < \infty$, with $u(x, 0) = e^{-x^2}$.	12	1, 5	6