Reg. No.																

Question Paper Code	14782

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

Third Semester

Mechanical Engineering

(Common to Mechanical and Automation Engineering)

24BSMA304 - TRANSFORMS AND NUMERICAL METHODS

Regulation - 2024

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

	Marks	K – Level	CO
1. The Laplace Transform exists if the function is: a) Discontinuous everywhere b) Periodiconly c) Piecewise continuous and of exponential order d) Constant only	1	K1	CO1
2. The unit step function is also called: a) Dirac function b) Heaviside function c) Gamma function d) Beta function	1	K2	CO1
3. The Laplace Transform of a periodic function mainly depends on: a)Amplitudeonly b) Period of the function c) Initial value only d) Frequency only	1	K2	CO1
4. Inverse Laplace Transform is used to convert: a) Time domain to frequency domain b) Frequency domain to time domain c) Algebraic equation to matrix d) Differential equation to integral equation	1	K1	CO2
5. The convolution theorem relates: a) Additionoftransforms b) Multiplication of transforms c) Division of transforms d) Differentiation of transforms	1	K2	CO2
6. Inverse Laplace transforms are useful in solving: a) Algebraic equations b) Differential equations c) Matrix equations d) Statistical problems	1	K2	CO2
7. Numerical methods are mainly used for: a) Exact analytical solutions b) Approximate solutions c) Graph plotting only d) Data storage	1	K1	CO3
8. An equation containing trigonometric or exponential terms is called: a) Algebraicequation b) Linear equation c) Transcendental equation d) Quadratic equation	1	K2	CO3
9. Newton–Raphson method requires: a) Integration of function b) Graphical solution c) Matrix inversion d) Derivative of function	1	K2	CO3
10. Interpolation is used to: a) solve differential equations b) Estimate unknown values within given data c) Find matrix inverse d) Compute integration only	1	K1	CO4
11. In interpolation, equal spacing between x-values is called: a) Interval b) Difference c) Equal interval d)Constant step size	1	K2	CO4

12. Lagrange interpolation formula is mainly useful when:
a) Data points are equally spaced b) Data points are unequally spaced *1 K2 CO4*
c) Values are periodic d) Functions are discontinuous

13. The Trapezoidal Rule approximates the area under a curve using
a) Rectangles b)Triangles *1 K1 CO5*
c)Trapeziums d) Circles

14. The interval width in numerical integration is usually denoted by
a) x b) y *1 K2 CO5*
c) h d) n

15. Which Python library is widely used for numerical computation?
a) NumPy b) Flask *1 K1 CO6*
c) Django d)Turtle

16. Pandas library is mainly used for:
a) Game development b) Data analysis *1 K2 CO6*
c) Web designing d) Networking

PART – A (ii) (Short Answer Questions)
(6 × 3 = 18 Marks)
Answer ALL Questions

17. Find L[cos5t sin2t]. *3 K3 CO1*

18. Analyze and determine the inverse Laplace transform of $\frac{s}{(s+2)^3}$ by expressing the function in a suitable form. *3 K4 CO2*

19. Apply the convergence condition of the Newton-Raphson Method to determine whether the method converges for the equation $x^3 - 2x$-5=0 near the initial approximation $x_0 = 2$. *3 K3 CO3*

20. Analyze the given data and construct the quadratic interpolation polynomial using Lagrange's Interpolation formula for the points (0,0), (1,1), (3,0). *3 K4 CO4*

21. Apply the Trapezoidal Rule to approximate the value of the definite integral $\int_0^4 x^2 dx$ by dividing the interval into equal subintervals. *3 K3 CO5*

22. Analyze the different data types available in Python and classify them with suitable examples based on their characteristics and applications in programming. *3 K4 CO6*

PART - B (iii)(Descriptive Answer Questions)
(6 × 11 = 66 Marks)
Answer ALL Questions

23. a) Find $L\left\{\frac{1-\cos t}{t}\right\}$. *11 K4 CO1*

b) Find the laplace transform of the rectangular wave given by $f(t) = \{^{1}_{-1}, ^{0<t<b}_{b<t<2b} with\ f(t+2b) = f(t)$ *11 K4 CO1*

24. a) Use Convolution Theorem to find $L^{-1}\{\frac{1}{(S+a)(s+b)}\}$ *11 K3 CO2*

OR

b) Solve $y'' - 3y' + 2y = e^{2t}, y(0) = -3, y'(0) = 5$ *11 K3 CO2*

25. a) Solve the system of equation by Guass Elimination Method *11 K3 CO3*
$2x + 3y - z = 5,\ 4x + 4y - 3z = 3, 2x - 3y + 2z = 2$

OR

b) Solve the system of equation by Guass Seidal Method *11 K3 CO3*
$4x + 2y + z = 14\ , x + 5y - z = 10, x + y + 8z = 20$

26. a) Using Newton's Forward Interpolation Formula, find the polynomial f(x) satisfying the following data. Hence, Evaluate y at x=5. *11 K3 CO4*

X	4	6	8	10
Y	1	3	8	10

OR

b) Using Lagrange's Interpolation Formula, find y(10) given that *11 K3 CO4*

$y(5) = 12, y(6) = 13, y(9) = 14, y(11) = 16$

27. a) Find the first and second derivative of the function tabulated below at X=0.4 *11 K4 CO5*

X:	0.4	0.5	0.6	0.7	0.8
Y:	1.5836	1.7974	2.0442	2.3275	2.6511

OR

b) Evaluate $\int_1^{1.4}\int_2^{2.4}\frac{1}{xy}dxdy$ Using Trapezoidal and Simpson's Rule. Verify your result by Actual Integration. *11 K4 CO5*

28. a) Apply the basic concepts of Python programming to develop a program that demonstrates the use of variables, data types, input/output statements, and control structures with suitable examples. *11 K3 CO6*

OR

b) Apply Python numerical tools and libraries to solve a real-world engineering problem by demonstrating the complete workflow including problem definition, data input, computation, visualization, and interpretation of results. *11 K3 CO6*