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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech. II Year I Semester Regular & Supplementary Examinations November-2025

NUMERICAL METHODS & TRANSFORM TECHNIQUES

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 70**

PART-A

(Answer all the Questions **10 x 2 = 20** Marks)

1	a	Find the root of the equation $x^2 - 5 = 0$ by using Bisection method.	CO1	L1	2M
	b	Solve by Jacoby method [Only two iterations] $x + y = 3\,; 3x - 2y = 4$.	CO1	L3	2M
	c	Write Newton's forward interpolation formulae.	CO2	L1	2M
	d	Write the normal equations used in fitting a second degree polynomial	CO2	L1	2M
	e	Write Taylor's formula for $y(x_1)$ to solve $y' = f(x,y)$ *with* $y(x_0) = y_0$.	CO3	L1	2M
	f	Write the formula for Runge – Kutta method of fourth order.	CO4	L1	2M
	g	What is the Linear Property of Laplace Transform.	CO5	L1	2M
	h	State Convolution Theorem.	CO5	L1	2M
	i	Write the conditions for Fourier Series Expansion.	CO6	L1	2M
	j	Write the formula for Fourier cosine transform.	CO6	L1	2M

PART-B

(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2	a	Find a positive root of the equation $x^3 - x - 1 = 0$by Bisection method.	CO1	L1	5M
	b	Find out the square root of 25 given $x_0 = 2.0$, $x_1 = 7.0$ using Bisection method.	CO1	L1	5M

OR

3		Solve the following system of equations by Gauss-Siedel method $4x + 2y + z = 14\,; x + 5y - z = 10\,; x + y + 8z = 20$.	CO1	L3	10M

UNIT-II

4	a	Using Newton's forward interpolation formula and the given table of values	CO2	L3	5M

x	1	1.4	1.8	2.2
f(x)	3.49	4.82	5.96	6.5

Obtain the value of *f(x)* when *x=1.6*.

	b	Applying Newton's forward interpolation formula, compute the value of $\sqrt{5.5}$ given that $\sqrt{5} = 2.236\,; \sqrt{6} = 2.449\,; \sqrt{7} = 2.646\,; \sqrt{8} = 2.828$.	CO2	L3	5M

OR

5		Find the curve of best fit of the type $y = ae^{bx}$ to the following data by method of least squares	CO2	L1	10M

X	1	5	7	9	12
Y	10	15	12	15	21

UNIT-III

6		Tabulate $y(0.1), y(0.2)$ *and* $y(0.3)$ using Taylor's series method given that $y^1 = y^2 + x$ and $y(0) = 1$	CO3	L3	10M

OR

7		Using Runge – Kutta method of fourth order, find $y(0.1)$ *and* $y(0.2)$ given that $\frac{dy}{dx} = x + y, y(0) = 1$.	CO4	L3	10M

UNIT-IV

8	a	Find the Laplace transform of $f(t) = e^{3t} - 2e^{-2t} + sin2t + cos3t + sinh3t - 2cosh4t + 9$.	CO5	L3	6M
	b	Find the Laplace transform of $f(t) = cosh\ at\ sin\ bt$	CO5	L3	4M
		OR			
9	a	Using Convolution theorem, Find $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$	CO5	L3	5M
	b	Using Convolution theorem, Find $L^{-1}\left\{\frac{1}{(s+a)(s+b)}\right\}$	CO5	L3	5M

UNIT-V

10		Obtain the Fourier series expansion of $f(x) = x^2$ in $0 < x < 2\pi$	CO6	L3	10M
		OR			
11	a	Prove that $F_c\{ x\ f(x) \} = \frac{d}{dp}[F_s(p)]$	CO6	L5	5M
	b	Prove that $F_s\{ x\ f(x) \} = -\frac{d}{dp}[F_c(p)]$	CO6	L5	5M

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