Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)

B. Tech (First Semester - Regular) Examinations, January 2026

25FYBS11001 – Applied Mathematics-I

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.	Find the Symmetric coefficient matrix of quadratic form $Q = x_1^2 - 2x_1x_2 + 4x_2x_3 - 9x_3^2$	CO1	K1
b.	Define Beta function and what is the Relation between beta and gamma function.	CO2	K1
c.	Find the Total derivative of U = $y\cos x$	CO3	K1
d.	Define Bernoulli's equation with an example.	CO4	K1
e.	State First shifting theorem	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	Prove that the Eigen values of a Hermitian matrix are Real.	5	CO1	K3
b.	Reduce the Quadratic Form $-5x_1^2 + 4x_1x_2 - 2x_2^2$ into canonical Form, using Orthogonal Transformation.	5	CO1	K3
	(OR)			
c.	Find the Eigen values and Eigen vectors of A = $\begin{pmatrix} -19 & 7 \\ -42 & 16 \end{pmatrix}$	5	CO1	K3
d.	Diagonolize the Matrix A= $\begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}$	5	CO1	K3
3.a.	Find the Radius of curvature of the curve x=a(θ +sinθ),y=a(1-cosθ) at θ=π/2	5	CO2	K3
b.	Verify the Rolle's theorem for $f(x)= (x+2)^3 (x-3)^4$ in [-2,3]	5	CO2	K3
	(OR)			
c.	Verify the Lagrange's Mean Value theorem for $f(x)= x^3-x^2-5x+3$ in [0, 4]	5	CO2	K3
d.	Find the Radius of curvature of the curve at any point(x,y) on the curve $y^2=4ax$	5	CO2	K3
4.a.	If U = $\sin^{-1}\frac{\sqrt{x} - \sqrt{y}}{\sqrt{x} + \sqrt{y}}$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$	5	CO3	K3
b.	Expand $f(x,y) = x^2 + xy + y^2$ by Taylor's series in powers of (x-2) and (y-3).	5	CO3	K3
	(OR)			
c.	Find the Maximum and Minimum values of $f(x, y) = x^3+3xy^2-3x$	5	CO3	K3
d.	If $Z = f(x + ay) + g(x - ay)$ then prove that $\frac{\partial^2 z}{\partial y^2} = a^2\frac{\partial^2 z}{\partial x^2}$	5	CO3	K3
5.a.	Solve $y'' + y' - 2y = 0$,y(0)=4 and $y'(0) = -5$	5	CO4	K3
b.	Solve $x\frac{dy}{dx} + 2y = x\sin x$	5	CO4	K3
	(OR)			
c.	Solve $\frac{dy}{dx} + \frac{y}{x} = x^2$	5	CO4	K3

d.	Solve $y'' + y = \sec x$ by using Method of Variation of parameters.	5	CO4	K3
6.a.	Find the Inverse Laplace Transformation of $\ln\frac{(s+2)}{(s+3)}$	5	CO5	K3
b.	Find the Laplace transform of the functions $e^{-t}cos2t$	5	CO5	K3
	(OR)			
c.	Solve $y'' - y' - 2y = 0$ $at\ y(0) = 8,\ y'(0) = 7$, Using Laplace transformation.	5	CO6	K3
d.	Using convolution theorem, find Laplace inverse transformation of $\frac{6}{s(s+1)}$	5	CO5	K3

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