Reg. No | | | | | | | | | | | AY 24

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR
(GIET UNIVERSITY)

B. Tech (First Semester - Regular) Examinations, December – 2024

23BBSBS11001– Engineering Mathematics - I

(Common to all branches except Biotech)

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.	What is the relation between Eigen vector a matrix A and its similar matrix $\hat{A}$ corresponding to same Eigen value λ.	CO1	K1
b.	Find out the value of $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ if $z = sin^{-1}(\frac{y}{x})$	CO1	K1
c.	Reduce the differential equation $3y^2y' + 2xy^3 = 2x$ into linear differential equation	CO2	K1
d.	Solve $x^2y'' - 3xy' + 4y = 0$	CO2	K1
e.	State Dirichlet's conditions.	CO1	K1

PART – B **(10 x 5 = 50 Marks)**

<u>Answer ***ALL*** the questions</u>		Marks	CO #	Blooms Level
2. a.	Determine the spectrum and Eigen vectors of the matrix A= $\begin{bmatrix} -10 & 10 & -15 \\ 10 & 5 & -30 \\ -5 & -10 & 0 \end{bmatrix}$ and also find the algebraic and geometric multiplicity of the Eigen values.	10	CO4	K2
	(OR)			
b.	Reduce the quadratic form $2x^2 + 2y^2 + 2z^2 - 2xy - 2yz - 2zx$ to canonical form through an orthogonal transformation. Also Find rank, index	10	CO3	K2
3.a.	If $u = tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$, $x \neq y$, then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = sin2u$	7	CO3	K2
b.	Discuss the Maxima and Minima at each stationary point of the function $f(x,y) = x^3 + y^3 - 3x - 12y + 20$	3	CO3	K2
	(OR)			
c.	Expand $f(x,y) = e^x cosy$ as a Taylor's series in powers of x and y.	5	CO2	K2
d.	Use the method of Lagrange multipliers to find the minimum value of the function $f(x,y,z) = x + y + z$ subject to the constraint $x^2 + y^2 + z^2 = 1$	5	CO3	K2
4.a.	Solve $xy' = y + x^4Cos^2(y/x)$, $y(1) = 0$	5	CO3	K2
b.	Solve $2xydx = (x^2 + y^2)dy, y(1) = 2$	5	CO2	K2
	(OR)			
c.	Solve ydx + [y + tan(x + y)]dy = 0.	5	CO2	K2
d.	Solve $(sec^2y)y' + 2x\, tany = 2x$	5	CO2	K2
5.a.	Solve by method of undetermined coefficients $3y'' + 10y' + 3y = 9x + 5cosx$	7	CO3	K2
b.	Solve by operator method $(D^2 - 4D + 4)y = e^{3x}$	3	CO2	K2
	(OR)			

c.	Solve by method of variation of parameters $(D^2 + 6D + 9)y = \frac{16e^{-3x}}{x^2+1}$	7	CO3	K2
d.	Determine the Particular integral of $(D^2 - 4D + 4)y = e^{2x} sinx$	3	CO3	K2
6.a.	Find Fourier series of the periodic function $f(x) = x, \quad (0 < x < 2\pi)$	6	CO4	K2
b.	Find the Half range cosine series of $f(x) = x^2, \ (0 < x < 1)$	4	CO4	K2
	(OR)			
c.	Find the Fourier series of the periodic function $f(x) = xsinx, \ (-\pi < x < \pi)$	10	CO4	K2

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