Question Paper

Exam Date & Time: 29-Nov-2023 (09:30 AM - 12:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. EXAMINATIONS - NOVEMBER / DECEMBER 2023 SUBJECT: MAT 1171/ MAT_1171 - ENGINEERING MATHEMATICS - I

Marks: 50

Answer all the questions.

1A)	The table below gives the values of tan x , where x is in radians								(4)
	x	0.10	0.15	0.20	0.25	0.30			
	tan x	0.1003	0.1511	0.2027	0.2553	0.3093			
	Using Newton's backward difference formula, find tan(0.26).								
1B)	Using Newton-Raphson method, find the real root of the equation $\cos x = 3x - 1$ where x is in radians, correct to three decimal places by taking $x_0 = 0.5$.								(3)
1C)	Using the following data, find $\frac{dy}{dx}$ at $x = 0$.								(3)
	$\frac{1}{dx}$ $x = 0$								
	<i>х</i> 0	0.1		0.2	0	.3	0.4	1	
	У 1.0	0.997	'5	0.9900	0	.9776	0.8604		
2A)	Using Runge Kutta method of order 4, find y(0.2), given $dv = v^2 - x^2$ with y(0.2)								(4)
	$\frac{dy}{dx} = \frac{y}{y^2 + x^2}$ with $y(0) = 1$								
	taking h=0.2. Correct to 4 decimal places.								
2B)	Using modified Euler's method, find								(3)
	$y(1.4)$, given that $\frac{dy}{dt} = 1 + \frac{y}{dt}$ with $y(1) = 2$ by taking $h = 0.2$.								
	dx = x Carry out 2 iterations in each step and correct to 4 decimal places.								
2C)	Using Simpson's 1 -rule, find an approximate value for the integral								(3)
,	$\int_{1}^{2} e^{\frac{-x}{2}} dx$ Take $h = 0.25$ and correct to 4 decimal places.								
3A)	Using Gram-Schmidt orthogonalization process find an orthonormal basis of								(4)
									(')
	\mathbb{D}^3 from the set of vectors $((1,1,2), (1,-1,2), (1,0,1))$								
	In the set of vectors $\{(1,1,2), (1,-1,2), (1,0,1)\}$.								
3B)	Solve	$(5x^4 +$	$-3x^2y$	$^{2}-2x$	y^3) dx	$+(2x^{3}y)$	$-3x^2y^2 - 3x^2y^2 - 3x^2 - $	$(5y^4)dy = 0$	(3)
		-	2		-		-		

Solve
$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x sinx$$

Prove that in a vector space *V* over a field *F*, every maximal linearly independent set of vectors forms a basis for *V*. (4)

Duration: 180 mins.

Solve
$$x^2y'' - xy' + 2y = x \sin(\log x)$$
 (3)
4C) Solve by Gauss Elimination Method:
 $3x_1 - 4x_2 + 5x_3 = -1$
 $-3x_1 + 2x_2 + x_3 = 1$
 $6x_1 + 8x_2 - x_3 = 35$
5A) Find all the eigen values and any two of the eigen vectors of the matrix
 $A = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$. (4)
5B) Solve by method of variation of parameters: $\frac{d^2y}{dx^2} + 4y = 4 \sec^2 2x$ (3)
5C) Using Gauss-Seidel method, solve the system of linear equations:
 $x + y + 54z = 110$ (3)

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$$27x + 6y - z = 54$$

$$6x + 15y + 2z = 72$$

Perform 3 iterations and correct the solution up to four decimal places by taking the initial approximation $x^{(0)} = y^{(0)} = z^{(0)} = 0$.

-----End-----