B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E.   **Semester: III**
Branch: AS/CV/EEE/ECE/EIE/IEM/ME/ML/TCE   **Duration: 3 hrs.**
Course Code: 19MA3BSEM3   **Max Marks: 100**
Course: Engineering Mathematics – 3

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

				CO	PO	Marks
		UNIT - I				
1	a)	Find the rank of the matrix $A = \begin{bmatrix} 2 & 3 & 4 & -1 \\ 5 & 2 & 0 & -1 \\ -4 & 5 & 12 & -1 \end{bmatrix}$ by reducing it to echelon form.		CO1	PO1	6
	b)	Solve the system of equations $x + y + z = 9, x - 2y + 3z = 8$ and $2x + y - z = 3$ by using Gauss Elimination Method.		CO1	PO1	7
	c)	Solve the system of equations $27x + 6y - z = 85$, $6x + 15y + 2z = 72$ and $x + y + 54z = 110$ by using Gauss-Seidel Method. Perform 2 iterations.		CO1	PO1	7
		UNIT – II				
2	a)	Obtain the complex form of the Fourier series for $f(x) = e^{-x}$ in $(-1,1)$.		CO2	PO1	6
	b)	Expand $f(x) = x^2$ as a Fourier Series in the interval $(-\pi, \pi)$.		CO2	PO1	7
	c)	Obtain the Fourier series upto first harmonic for the following data.		CO2	PO1	7
		<table><tr><td>x</td><td>$0°$</td><td>$45°$</td><td>$90°$</td><td>$135°$</td><td>$180°$</td><td>$225°$</td><td>$270°$</td><td>$315°$</td></tr><tr><td>y</td><td>2</td><td>1.5</td><td>1</td><td>0.5</td><td>0</td><td>0.5</td><td>1</td><td>1.5</td></tr></table>				
		UNIT – III				
3	a)	Obtain the Fourier cosine transform of the function $f(x) = \begin{cases} 4x & ; & 0 < x < 1 \\ 4 - x & ; & 1 < x < 4 \\ 0 & ; & x > 4 \end{cases}$		CO2	PO1	6
	b)	Find the Fourier Sine transform of e^{-x}. Hence prove that $\int_0^\infty \frac{x \sin mx}{1+x^2} dx = \frac{\pi}{2} e^{-m}, m > 0$.		CO2	PO1	7
	c)	Using Parseval's identities for the function $f(t) = e^{-at}$ and $g(t) = e^{-bt}$, prove that $\int_0^\infty \frac{dt}{(a^2+t^2)(b^2+t^2)} = \frac{\pi}{2ab(a+b)}$.		CO2	PO1	7
		OR				
4	a)	Find the Fourier cosine and sine transform of e^{-ax}, $a \geq 0$.		CO2	PO1	6

	b)	Find the Fourier transform of $f(x) = \begin{cases} 1 - |x| & ; & |x| \le 1 \\ 0 & ; & |x| > 1 \end{cases}$	CO2	PO1	**7**
	c)	Employ Convolution theorem to find $F(f * g)$ given $f(x) = g(x) = \begin{cases} 1, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$	CO2	PO1	**7**
		UNIT - IV			
5	a)	Apply Newton-Raphson method to find the approximate root of the equation $3x = cosx + 1$ that lies near $x = 0.6$.	CO1	PO1	**6**
	b)	Apply Newton-Gregory backward interpolation formula to find $f(4)$ for the following data | x	0	1	2	3 | |---|---|---|---|---| | $f(x)$ | 1 | 2 | 1 | 10 |	CO1	PO1	**7**
	c)	Evaluate $\int_0^1 \frac{x}{1+x^2} dx$ by Weddle's rule by dividing the interval in to six equal parts.	CO1	PO1	**7**
		UNIT - V			
6	a)	Find the extremal of the functional $\int_0^{\pi/2}[y^2 - (y')^2 + 2y\,sinx]\,dx$ under the end conditions $y(0) = y\left(\frac{\pi}{2}\right) = 0$.	CO3	PO1	**10**
	b)	Given that $Z(u_n) = \frac{2z^2+3z+4}{(z-3)^3}$, show that $u_1 = 2, u_2 = 21$ and $u_3 = 139$.	CO2	PO1	**10**
		OR			
7	a)	Find the path in which a particle, in the absence of friction will slide from one point to another in the shortest time under the action of gravity.	CO3	PO1	**10**
	b)	Solve the difference equation $u_{n+2} + 2u_{n+1} + u_n = n$ with $u_0 = u_1 = 0$ using Z-transforms.	CO2	PO1	**10**

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