Register Number:……………..

KUMARAGURU
college of technology
character is life

B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2017)

First Semester

FASHION TECHNOLOGY

U17MAT1103**:** Algebra and Differential Equations

COURSE OUTCOMES

CO1: Identify eigenvalues and eigenvectors of matrices and examine the consistency of system of linear equations.
CO2: Estimate the convergence of infinite series through various methods.
CO3: Solve first order ordinary differential equations of certain types and apply in some physical situations.
CO4: Apply numerical techniques to solve first order ordinary differential equations.
CO5: Identify the solution of the higher order ordinary differential equations using various methods.
CO6: Know how to find the Fourier Series and half range Fourier Series of a function given explicitly and to find Fourier Series of numerical data using harmonic analysis.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Find the sum and product of the eigen values of the matrix $\begin{bmatrix} 8 & 1 & 6 \\ 3 & 5 & 7 \\ 4 & 9 & 2 \end{bmatrix}$.	CO1	[K_2]
2.	State Cayley Hamilton theorem.	CO1	[K_1]
3.	What is conditional convergence?	CO2	[K_1]
4.	What is Leibniz's test for alternating series?	CO2	[K_1]
5.	Transform $\frac{dy}{dx} + xsin2y = x^3cos^2y$ to Lebinitz equation form.	CO3	[K_2]
6.	Given $y' = -y$ and y(0)=1, determine the value of y at x =0.01.	CO4	[K_2]
7.	Transform $\left((2x-1)^2 D^2 - 4(2x-1)D + 8\right)y = 0$ to a differential equation with constant coefficients.	CO5	[K_3]
8.	Solve $y''+3y'+6y=0$.	CO5	[K_3]
9.	Define Dirichlet's conditions.	CO6	[K_1]
10.	What is Harmonic analysis?	CO6	[K_1]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Find eigenvalue and eigenvectors of the matrix A= $\begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$	8	CO1	[K_3]
	b)	Verify Cayley Hamilton theorem if A= $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{pmatrix}$	8	CO1	[K_3]
12.	a)	Explain Comparison test and D'Alembert's ratio test.	8	CO2	[K_1]
	b)	Discuss the concept of absolute and conditional convergence with example.	8	CO2	[K_1]
13.	a)	Explain the process of exponential growth and decay process.	8	CO3	[K_3]
	b)	Solve $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$	8	CO3	[K_3]
14.	a)	Solve $\frac{dy}{dx} = x + y$ given y(1)=0 and determine y(1.1) by Taylor's series method.	8	CO4	[K_3]
	b)	Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, at x = 0.2, 0.4 given y(0) = 1.	8	CO4	[K_3]
15.	a)	Using method of variation of parameters solve $y'' + 4y = \tan 2x$.	8	CO5	[K_3]
	b)	Solve $\left(x^2D^2 - 2xD - 4\right)y = 32(\log x)^2$	8	CO5	[K_3]
16.	a)	Obtain the Fourier series of the function $f(x) = 1 + x + x^2$ in $(-\pi, \pi)$.	8	CO6	[K_3]
	b)	Expand f (x) in a Fourier series first harmonic using the following table	8	CO6	[K_3]

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$
$y = f(x)$	1	1.4	1.9	1.7	1.5	1.2

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