Q.P Code D134141	Total Pages 2	Name 672225
		Register No.

THIRD SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(CUFYUGP)

MAT3MN202
Differential Equations and Fourier Series

2024 Admission Onwards

Maximum Time :2 Hours	Maximum Marks :70

Section A

All Question can be answered. Each Question carries 3 marks (Ceiling: 24 Marks)

1	Solve the differential equation $dy - (y - 1)^2 dx = 0$
2	Find the general solution of the differential equation $x\dfrac{dy}{dx} + 3y = 3$.
3	Verify that the given two-parameter family of functions $y = c_1 \cos x + c_2 \sin x + x \sin x + (\cos x) \ln(\cos x)$ is the general solution of the nonhomogeneous differential equation $y'' + y = \sec x$ on the interval $(-\pi/2, \pi/2)$.
4	Find the general solution of the second-order differential equation $y'' + 8y' + 16y = 0$
5	Write the Fourier Series expansion of $f(x) = x^2$ in the interval $-1 < x < 1$
6	Write general form of a linear second-order partial differential equation. When will it become homogeneous or non-homogeneous?
7	Classify the following equation $$\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial y^2}$$
8	Find a complex number z satisfying the equation $\dfrac{z}{\bar{z} + 1} = 3 + 4i$.
9	Describe the set of points in the complex plane that satisfies $|z - i| = |z + 1|$
10	Give the points at which the function $f(z) = \dfrac{2i}{z^2 - 2z + 5iz}$ will not be analytic.

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Section B

All Question can be answered. Each Question carries 6 marks (Ceiling: 36 Marks)

11	Solve $(2xy^2 + 3)dx + (2x^2y + 4)dy = 0$
12	Solve $y(x + y + 1)dx + (x + 2y)dy = 0$
13	Solve the boundary-value problem $y'' - 2y' + 2y = 0, y(0) = 1, y'(\pi) = 1$
14	Solve $x^2y'' + xy' + 4y = 0$
15	Find the Fourier series of the function f on the given interval. $$f(x) = \begin{cases} 0 & -1 < x < 0 \\ x & 0 \le x < 1 \end{cases}$$
16	Use separation of variables to find, if possible, product solutions for the following partial differential equation. $$u_x + u_y = u$$
17	Find all roots of $(-1 + i)^{1/3}$
18	Show that the function $f(z) = 4x^2 + 5x - 4y^2 + 9 + i(8xy + 5y - 1)$ is analytic everywhere in the complex plane.

Section C

Answer any ONE. Each Question carries 10 marks (1x10=10 Marks)

19	Solve the initial value problem $\dfrac{dy}{dx} = \dfrac{1 - x - y}{x + y}; y(0) = 1$
20	Solve $y'' + 4y' - 2y = 2x^2 - 3x + 6$.