K24U 3588

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree (C.B.C.S.S. – O.B.E.-Regular) Examination, November 2024
(2023 Admission)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS FOR B.Sc. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
3C03MAT-AIML : Differential Equations and Fourier Series

Time : 3 Hours Max. Marks : 40

PART – A

(Short Answer)

Answer **all** questions from this Part. **Each** question carries **1** mark. **(6×1=6)**

1. Define order of a differential equation.
2. Define Wronskian.
3. Write the standard equation of linear differential equation.
4. Write the characteristic equation of $25\frac{d^2y}{dx^2} + y = \cos 7x$.
5. Define basis of solutions of a homogeneous second order differential equation.
6. Define an odd function in the context of Fourier series.

PART – B

(Short Essay)

Answer **any six**, questions from this Part. **Each** question carries **2** marks. **(6×2=12)**

7. Check the exactness of $y' = 1 + y^2$.
8. Solve $y' + (x + 2)y^2 = 0$.
9. Find the general solution of $y' + y = 5.2$.

P.T.O.

10. Find the integrating factor of $ydx - xdy = 0$.

11. Find the general solution of $\frac{d^2y}{dx^2} - 4y = 0$.

12. Verify that $y = \tan(x + c)$ is a solution of $y' = 1 + y^2$.

13. Show that sum of two odd function is odd.

14. Write the Euler formula for Fourier coefficients of a function f(x).

PART – C
(Essay)

Answer **any four** questions from this Part. **Each** question carries **3** marks. **(4×3=12)**

15. Solve $(x + 4)(y^2 + 1)dx + y(x^2 + 3x + 2)dy = 0$.

16. Solve $xy' + y = xy^{\frac{3}{2}}$, $y(1) = 4$.

17. Solve $\frac{d^2y}{dx^2} - 12\frac{dy}{dx} + 36y = e^{6x}$.

18. Solve $\frac{d^2y}{dx^2} + 25y = 2\sin 5x$.

19. Express $f(x) = \frac{1}{2}$, if $0 < x < \pi$ and $f(x) = 0$, if $x > \pi$ as a Fourier sine integral.

20. Expand the function defined by $f(x) = 0$ if $-2 < x < 0$ and $f(x) = x$ if $0 \leq x < 2$ as a Fourier series in $[-2, 2]$.

PART – D
(Long Essay)

Answer **any two**, questions from this Part. **Each** question carries **5** marks. **(2×5=10)**

21. Check the exactness and solve $(5xy + 4y^2 + 1)dx + (x^2 + 2xy)dy = 0$.

22. Solve $x^2y'' - 2xy + 2y = 0$, $y(1) = 1$, $y'(1) = 1$.

23. Solve $y'' - 3y' + 2y = 2x^2 + e^x + 2xe^x + 4e^{3x}$.

24. Obtain the half range Fourier cosine series for the function $f(x) = \cos x$ if $0 < x < \frac{\pi}{2}$ and $f(x) = 0$ if $\frac{\pi}{2} < x < \pi$ in the interval $(0, \pi)$.