Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, November 2024
(2019 to 2023 Admissions)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
3C03 MAT-ST : Mathematics for Statistics – III

Time : 3 Hours   Max. Marks : 40

PART – A

Answer **any four** questions from this Part. **Each** question carries 1 mark. **(4×1=4)**

1. Find the order of the ODE, $7y''' + xy'' - (y')^5 = \sin x$.

2. Show that $y_1 = e^x$ and $y_2 = e^{-x}$ are linearly independent functions.

3. Write the characteristic equation of $\dfrac{d^2y}{dx^2} + 5\dfrac{dy}{dx} + 4 = 8\cos x$.

4. Find the Laplace transform of $f(t) = \sin 4t$.

5. What do you mean by mathematical modelling ?

PART – B

Answer **any 7** questions from this Part. **Each** question carries 2 marks. **(7×2=14)**

6. Solve the differential equation $y' = 1 + y^2$.

7. Check whether $\dfrac{dy}{dx} = \dfrac{x^2}{y^2}$ is exact or not.

8. Write the general form of Bernoulli equation.

9. Solve the differential equation $y'' - y = 0$.

10. Solve the differential equation $y'' - 6y' + 9y = 0$.

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11. Find a differential equation whose solution is $\sin 3x$.

12. Find the Laplace transform of $f(t) = \cosh at$.

13. Find the Laplace transform of $f(t) = e^{6t} \sin \omega t$.

14. Write down the Euler formula for calculating the Fourier coefficient.

15. Verify that $y = ce^{-4x} + 0.35$ is a solution of $y' + 4y = 1.4$. Also find the particular solution when, $y(0) = 2$.

PART – C

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

16. Solve the differential equation $\dfrac{dy}{dx} = \dfrac{y}{x} + \tan\left(\dfrac{y}{x}\right)$.

17. Solve $y'' + 8y' + 25y = \sin 3x$.

18. Solve $y'' - 3y' + 2y = e^{3x}$.

19. Find the inverse of the transform $L(f) = \dfrac{3s - 137}{s^2 + 2s + 401}$.

20. Show that the Laplace transform is a linear operator.

21. State the orthogonality property of the trigonometric system.

22. Solve $2xyy' = y^2 - x^2$.

PART – D

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

23. Solve $x^2y'' + xy' + y = \log x + x$.

24. Find the inverse transform of $\ln\left(1 + \dfrac{\omega^2}{s^2}\right)$.

25. Find the Fourier series of the function $f(x) = x + \pi$ if $-\pi < x < \pi$ and $f(x + \pi) = f(x)$.

26. Solve $y' = (y + 4x)^2$.