Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, November 2023
(2019 to 2022 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. **Each** question carries **1** mark.

1. Solve $y' + \sin x = 0$.

2. Let $y_1 = x^3$, $y_2 = x^2$. Find the Wronskian $W(y_1, y_2)$.

3. Find the Laplace transform of $\cosh at$.

4. Check whether $\sin^2 x$ is an even function or odd function.

5. Find the fundamental period of $\sin \pi x$.

PART – B

Answer **any seven** questions. **Each** question carries **2** marks.

6. Verify that $y = \dfrac{c}{x}$ (c an arbitrary constant) is a solution of the ODE $xy' = -y$ for all $x \neq 0$.

7. Solve $y' = 1 + y^2$.

8. Solve the initial value problem $xy' + y = 0$, $y(4) = 6$.

9. Determine whether $y_1(x) = x^2$, $y_2(x) = x^2/\ln x$, $x > 1$ are linearly independent or not.

10. Find the general solution of $4y'' - 25y = 0$.

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11. Find the Laplace transform of $e^{2t} \sinh t$.

12. Find the inverse Laplace transform of $\dfrac{s + 10}{s^2 - s - 2}$.

13. Find the Laplace transform of $\dfrac{1}{2} t e^{-3t}$.

14. Find the Fourier series of the function $f(x) = x^2$, $-\pi < x < \pi$.

15. Prove that $\cos nx$ and $\cos mx$ ($n \neq m$) are orthogonal in the interval $[-\pi, \pi]$.

PART – C

Answer **any four** questions. **Each** question carries **3** marks.

16. Test for exactness and if exact solve $\sin x \cos y \, dx + \cos x \sin y \, dy = 0$.

17. Find the general solution of $y' + ky = e^{-kx}$.

18. Solve the initial value problem $y'' + y' - 2y = 0$, $y(0) = 4$, $y'(0) = -5$.

19. Solve $x^2 y'' + 0.5xy' - 0.5y = 0$, $y(1) = 1$, $y'(1) = 2$.

20. Using method of convolution, find the inverse Laplace transform of $\dfrac{1}{(s^2 + 1)^2}$.

21. Find the Laplace transform of $\sinh 2t \sin 3t$.

22. Find the Fourier series of $f(x) = \begin{cases} -k & \text{if } -\pi < x < 0 \\ k & \text{if } 0 < x < \pi \end{cases}$ and $f(x + 2\pi) = f(x)$.

PART – D

Answer **any two** questions. **Each** question carries **5** marks.

23. Solve $y' + y \sin x = e^{\cos x}$, $y(0) = -2.5$.

24. Solve $y'' - 4y' + 4y = \dfrac{6e^{2x}}{x^4}$ by the method of variation of parameters.

25. Using Laplace transform solve $y'_1 = -y_1 + 4y_2$, $y'_2 = 3y_1 - 2y_2$, $y_1(0) = 3$, $y_2(0) = 4$.

26. Find two half range expansions of the function $f(x) = \pi - x$, $0 < x < \pi$.

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