



Reg. No. : .....

Name : .....

**Third Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/  
Improvement) Examination, November 2022  
(2019 Admission Onwards)**

**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 **one** mark.

1. Give the standard form of Bernoulli equation.
2. Using Wronskian, prove that  $\cos 5x$  and  $\sin 5x$  are linearly independent.
3. Find the Laplace transform of  $\sinh at$ .
4. Find  $\mathcal{L}(t \sin \omega t)$ .
5. Find the fundamental period of  $\sin 2\pi x$ .

**PART – B**

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

6. Solve  $y' = 1 + y^2$ .
7. Test exactness for  $(x^2 + y^2) dx - 2xy dy = 0$ .
8. Find the general solution of  $y' - y = 5.2$ .
9. Prove that  $e^{-x} \cos x$  and  $e^{-x} \sin x$  forms a basis of solutions of  $y'' + 2y' + 2y = 0$ .
10. Solve the initial value problem  $y'' + y' - 2y = 0$ ,  $y(0) = 4$ ,  $y'(0) = -5$ .
11. Prove that  $\mathcal{L}(t^a) = \frac{\Gamma(a+1)}{s^{a+1}}$ ,  $a > 0$ .

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12. Find Laplace transform of  $\sinh t \cos t$ .13. Find  $\mathcal{L}^{-1} \left[ \frac{6s+7}{2s^2+4s+10} \right]$ .14. Find the inverse transform of  $\ln \left( 1 + \frac{\omega^2}{s^2} \right)$ .15. Find the Fourier sine series of the function  $f(x) = \pi - x$  in  $0 < x < \pi$ .

**PART – C**

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

16. Find an integrating factor and solve the initial value problem  $(e^{x+y} + ye^y) dx + (xe^y - 1) dy = 0$ ,  $y(0) = -1$ .
17. Solve the initial value problem  $y' + y \sin x = e^{\cos x}$ ,  $y(0) = -2.5$ .
18. Solve the initial value problem  $y'' - y' - 2y = 0$ ,  $y(0) = 4$ ,  $y'(0) = -5$ .
19. Solve  $x^2 y'' - xy' + y = 0$ ,  $y(1) = 1.5$ ,  $y'(1) = 0.25$ .
20. Using Laplace method solve  $y'' + y = 6$ ,  $y(0) = 1$ ,  $y'(0) = -2$ .
21. Find Fourier series of  $f(x) = \begin{cases} 0, & \text{if } -\pi < x < 0 \\ x, & \text{if } 0 < x < \pi \end{cases}$ , which is a periodic function with period  $2\pi$ .
22. Find the Fourier series of the function  $f(x) = \begin{cases} -1, & \text{if } -2 < x < 0 \\ 1, & \text{if } 0 < x < 2 \end{cases}$ , with period  $p = 4$ .

**PART – D**

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

23. Solve  $y' = 3.2y - 10y^2$ .
24. Using method of variation of parameters, solve  $y'' + 4y = \tan 2x$ .
25. Using Laplace transform, solve  $y_1' = 2y_1 - 3y_2$ ,  $y_2' = y_2 - 2y_1$ ,  $y_1(0) = 8$ ,  $y_2(0) = 3$ .
26. Find the Fourier series of  $f(x) = \begin{cases} -k, & \text{if } -\pi < x < 0 \\ k, & \text{if } 0 < x < \pi \end{cases}$  and  $f(x + 2\pi) = f(x)$ . Also deduce that  $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$ .