



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 – CH : MATHEMATICS FOR CHEMISTRY – III**

Time : 3 Hours

Max. Marks : 40

PART – AAnswer **any four** questions. **Each** question carries **1** mark.

1. Solve $y' = \cosh 5x$.
2. Give an example of a first order ordinary differential equation.
3. Let $y_1 = e^{4x}$ and $y_2 = e^{-1.5x}$. Find the Wronskian $W(y_1, y_2)$.
4. Find the Laplace transform of e^{at} .
5. Check whether $\sin(x^2)$ is an even function or an odd function.

PART – BAnswer **any seven** questions. **Each** question carries **2** marks.

6. Verify that $y = \frac{c}{x}$ (c an arbitrary constant) is a solution of the ODE $xy' = -y$ for all $x \neq 0$.
7. Solve the initial value problem $y' = \frac{-4x}{y}$, $y(2) = 3$.
8. Check whether the differential equation $2xy dx + x^2 dy = 0$ is exact or not.
9. Determine whether $y_1(x) = x$, $y_2(x) = x^2$, $y_3(x) = 4x - 3x^2$ are linearly independent on the interval $(-\infty, \infty)$.
10. Find the general solution of $4y'' - 25y = 0$.

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11. Find the Laplace transform of $e^{at}\cos\omega t$.
12. Find the inverse Laplace transform of $\frac{s+10}{s^2-s-2}$.
13. Find the Laplace transform of $(t+1)^2e^t$.
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 on the interval $[-\pi, \pi]$.

PART – CAnswer **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 $y' = 2y - 4x$.
18. Solve the initial value problem $y'' + y' - 2y = 0$, $y(0) = 4$, $y'(0) = -5$.
19. Solve $x^2y'' - 6xy' + 9y = 0$, $y(1) = 1$, $y'(1) = 1$.
20. Using method of convolution, find the inverse Laplace transform of $\frac{1}{(s^2+1)^2}$.
21. Solve the Volterra integral equation $y(t) - \int_0^t (1+\tau)y(t-\tau) d\tau = 1 - \sinh t$.
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 – DAnswer **any two** questions. **Each** question carries **5** marks.

23. Solve $y' + y \sin x = e^{\cos x}$, $y(0) = -2.5$.
24. Solve $y'' + 9y = \sec 3x$ 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 $f(x) = \pi - x$, $0 < x < \pi$.