Reg. No. : ....

Name : ....

Third Semester B.Sc. Degree (CBCSS – OBE-Regular/Supplementary/
Improvement) Examination, November 2022
(2019 Admission Onwards)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
3C03MAT – CH : Mathematics for Chemistry – III

Time : 3 Hours

Max. Marks : 40

PART– A

Answer **any four** questions. **Each** question carries **one** mark.

1. Solve $y' = y$.

2. Give the standard of a first order linear ordinary differential equation.

3. Let $y_1 = \cos wx$ and $y_2 = \sin wx$. Find the Wronskian $W(y_1, y_2)$.

4. Find the Laplace transform of cosh at.

5. Let $f(x)$ and $g(x)$ be periodic function with period p. Find the period of
   $af(x) + bg(x)$, where a and b are constants.

PART – B

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

6. Verify that $y = ce^{-4x} + 0.35$ is a solution of the ODE $y' + 4y = 1.4$.

7. Solve the initial value problem $y' = \dfrac{-4x}{y}$, $y(2) = 3$.

8. Solve $\cos(x + y)\, dx + (3x^2 + 2y + \cos(x + y))dy = 0$.

P.T.O.

9. Verify that $\cos 3x$ and $\sin 3x$ are linear linearly independent and form a basis of solution of $y'' + 9y = 0$.

10. Find a general solution of $y'' - 0.25y = 0$.

11. Find the inverse Laplace transform of $\dfrac{-s + 11}{s^2 - 2s - 3}$.

12. Prove that $\mathscr{L}(t\sinh at)$ is $\dfrac{2as}{(s^2 - a^2)^2}$.

13. Using Laplace transform, solve $y'' - y = t$, $y(0) = 1$, $y'(0) = 1$.

14. Using convolution find $\mathscr{L}^{-1} \dfrac{1}{s^2(s - a)}$.

15. Find the Fourier series of $f(x) = |x|$ in $\pi < x < \pi$, which is assumed to be a periodic function with period 2π.

PART – C

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

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

17. Solve the initial value problem $y' + y\tan x = \sin 2x$, $y(0) = 1$.

18. Solve $y'' + 3y' + 2.25y = -10e^{-1.5x}$.

19. Solve the initial value problem $y'' + y' = 8x^2$, $y(0) = -3$, $y'(0) = 0$.

20. Using Laplace method solve $y'' + y' - 6y = 0$, $y(0) = 1$, $y'(0) = 1$.

21. Find a Fourier series to represent $f(x)$ in the interval $(-\pi, \pi)$, where
$$f(x) = \begin{cases} -k & \text{if} \quad -\pi < x < 0 \\ k & \text{if} \quad 0 < x < \pi \end{cases} \quad \text{and} \quad f(x + 2\pi) = f(x).$$

22. Find the Fourier series of the function $f(x) = \begin{cases} 0 & \text{if} \quad -2 < x < 1 \\ 1 & \text{if} \quad -1 < x < 1 \\ 0 & \text{if} \quad 1 < x < 2 \end{cases}$ with period $p = 4$.

PART – D

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

23. Solve $y' + xy = xy^{-1}$, $y(0) = 3$.

24. Using method of variation of parameters, solve $y'' + y = \sec x$.

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

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

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