K20U 1837

Reg. No. : .....

Name : .....



III Semester B.Sc. Degree CBCSS (OBE) – Regular Examination, November 2020
(2019 Admission Only)
Complementary Elective Course in Mathematics
3C03 MAT-BCA : Mathematics for BCA III

Time : 3 Hours Max. Marks : 40

PART – A

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

1. Is $(2 + 3x^2y^2)\,dx + 2x^3y\,dy = 0$ exact ?
2. Write characteristic equation of $y''' + 3y' - 4y = 0$.
3. Write the Laplace transform of $t^2$.
4. Write the fundamental period of $\cos\pi x$.
5. What is the Fourier series of an odd function f(x) defined on [–L, L] ? **(4×1=4)**

PART – B

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

6. Solve the initial value problem $y' = -2xy$, $y(0) = 2.3$.
7. Verify that $y = e^{-x}$ is a solution of $y'' = y$.
8. Solve $y' + y\tan x = \sin 2x$.
9. Solve the initial value problem $y' + y = y^2$, $y(0) = \frac{-1}{3}$.
10. Find general solution to $y'' + 9y' + 20y = 0$.
11. Find Wronskian of $e^x$ and $xe^x$.
12. Find the inverse Laplace transform of $\frac{1}{(s-a)s}$ using convolution.

P.T.O.

13. Solve the Volterra integral equation of the second kind

$$y(t) - \int_0^t y(\tau)\sin(t-\tau)d\tau = t.$$

14. Find the Fourier series of the function $f(x) = x + \pi$ if $-\pi < x < \pi$ and $f(x + 2\pi) = f(x)$.

15. Find Fourier series for the following function.

$$f(x) = \begin{cases} 0 & \text{if } -2 < x < -1 \\ k & \text{if } -1 < x < 1 \\ 0 & \text{if } 1 < x < 2 \end{cases}$$

**(7×2=14)**

## PART – C

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

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

17. Solve the initial value problem $(\cos y \sinh x + 1)\,dx - (\sin y \cosh x)\,dy = 0$, $y(1) = 2$.

18. Solve $y'' + 2y' + y = 2\sin x$.

19. Solve $x^2y'' + xy' + 9y = 0$.

20. Solve the initial value problem $y'' - y = t$, $y(0) = 1$ and $y'(0) = 1$ using Laplace transform.

21. Find Laplace transform of $f(t) = \sin 2t + 2t\cos 2t$.

22. Find the Fourier series of

$$f(t) = \begin{cases} 0 \text{ if } -\dfrac{\pi}{\omega} < t < 0 \\ E\sin\omega t \text{ if } 0 < x < \dfrac{\pi}{\omega}. \end{cases}$$

**(4×3=12)**

## PART – D

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

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

24. Solve :

    a) $y'' + 4y' + 4y = e^{-x}\cos x$.

    b) $y'' + 5y' + 6y = e^{-3x}$.

25. Find the inverse Laplace transform of

    a) $\dfrac{3s-137}{s^2+2s+401}$

    b) $\ln\left(1+\dfrac{\omega^2}{s^2}\right)$

26. Find the Fourier series of

$$f(x)=\begin{cases}-k & \text{if } -\pi < x < 0\\ k & \text{if } 0 < x < \pi\end{cases}$$

Also show that $1-\dfrac{1}{3}+\dfrac{1}{5}-\dfrac{1}{7}+\ldots=\dfrac{\pi}{4}$ **(2×5=10)**