K22U 3638

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-BCA : Mathematics for BCA III

Time : 3 Hours Max. Marks : 40

PART – A

(Short Answer Questions)

Answer **any four** questions from this Part. **Each** question carries **1** mark.

1. Verify that $y = c/x$ where c is an arbitrary constant is a solution of ODE $xy' = -y$ for $x \neq 0$.
2. Show that the ODE, $y' = 1 + x^2$ is separable and hence find the solution.
3. Find the characteristic equation of the differential equation $y'' - 2y = 0$.
4. Let $f(t) = e^t$, $t \geq 0$. Find F(s).
5. Find the fundamental period of the function $f(x) = \sin(10x)$.

PART – B

(Short Essay Questions)

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

6. Show that the differential equation $\cos(x + y)dx + (3y^2 + 2y + \cos(x + y))dy = 0$ is an exact differential equation.
7. Find an integrating factor of the ODE, $-ydx + xdy = 0$.
8. Solve $y' = (4x + y)^2$.
9. Give examples for each of the following :
   a) Homogeneous Linear Ordinary Differential Equation.
   b) Bernoulli Equation.

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10. Reduce the equation $y' + y/x = y^2$ to a linear ODE.

11. Solve the differential equation $y'' + y' + 0.25y = 0$.

12. Find the Wronskian of the functions $y_1 = \sin 2x$, $y_2 = \cos 2x$.

13. Find the Laplace transform of cosh at and sinh at.

14. Find the inverse Laplace transform of $F(s) = \frac{1}{s^2 + 3s + 2}$.

15. Find the Fourier coefficient a_0 for the function $f(x) = \begin{cases} -k, -\pi < x < 0 \\ k, 0 < x < \pi \end{cases}$ and $f(x + 2\pi) = f(x)$.

PART – C

(Essay Questions)

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

16. Solve $y' = xy + x + y + 1$.

17. Solve the Euler-Cauchy equation $x^2y'' + 1.5xy' - 0.5y = 0$.

18. Check whether the functions $y_1 = e^x \sin x$ and $y_2 = e^{-x} \sin x$ are linearly independent or not in the interval $(0, \pi)$.

19. Using Laplace Transform of the Derivative formula, find the Laplace Transform of $f''(t)$, where $f(t) = t \sin \omega t$ and $f'(0) = 0$.

20. Let $H(s) = \frac{1}{(s^2 + \omega^2)^2}$. Find $h(t)$.

21. Write the Fourier coefficients a_0, a_n, b_n for the function $f(x)$ of period $p = 2L$.

22. Find the Fourier series of the function $f(x) = x$ with $f(x + 2\pi) = f(x)$.

PART – D

(Long Essay Questions)

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

23. Find an integrating factor and solve the initial value problem

$(e^{x+y} + ye^{y})\,dx + (xe^{y} - 1)\,dy = 0,\ y(0) = -1.$

24. Solve the initial value problem $y'' + 0.4y' + 9.04y = 0,\ y(0) = 0,\ y'(0) = 3.$

25. Find the inverse transform of $\ln \frac{s^2 + \omega^2}{s^2}$.

26. Find the Fourier series of the function $f(x) = \begin{cases} 0, -2 < x < -1 \\ k, -1 < x < 1 \\ 0, 1 < x < 2 \end{cases}$.