



K22U 2323

Reg. No. :

Name :

**V Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/
Improvement) Examination, November 2022
(2019 Admission Onwards)
CORE COURSE IN MATHEMATICS**

5B08MAT : Differential Equations and Laplace Transforms

Time : 3 Hours

Max. Marks : 48

**PART – A
(Short Answer)**

Answer **any four** questions from this Part. **Each** question carries **1** mark. **(4×1=4)**

1. Solve $dy + ydx = 0$.
2. State the order of the ODE $y'' + \pi y^3 = 0$.
3. Define Wronskian.
4. Write the characteristic equation of $\frac{d^3y}{dx^3} + y = \sin 4x$.
5. Define unit step function.

**PART – B
(Short Essay)**

Answer **any eight** questions from this Part. **Each** question carries **2** marks. **(8×2=16)**

6. Find the integrating factor of $ydx - xdy = 0$.
7. Find the order and degree of $\frac{d^3y}{dx^3} + 2\left(\frac{dy}{dx}\right)^{\frac{1}{2}} = 0$.
8. Show that a separable equation is also exact.
9. State the uniqueness theorem of first order differential equation.
10. Find the basis of the solution of the equation $\frac{d^2y}{dx^2} + y = 0$.

P.T.O.

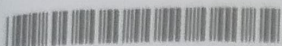
11. Find the general solution of $\frac{d^2y}{dx^2} + 4y = 0$.
12. Write the standard form of Euler-Cauchy equation. Give one example of it.
13. Find the Wronskian of e^x and e^{-x} .
14. Find the convolution of t and e^{-t} .
15. Find the Laplace transform of $f(t) = t \cos 4t$.

16. Evaluate $L^{-1} \left[\frac{2}{(s+4)^3} \right]$.

PART - C
(Essay)

Answer **any four** questions from this Part. **Each** question carries **4** marks. **(4x4)**

17. Find the orthogonal trajectories of the family $y^2 = 2x^2 + c$.
18. Solve $(xy' + y = xy^{\frac{3}{2}}, y(1) = 4$.
19. Solve $\frac{d^2y}{dx^2} - 13\frac{dy}{dx} + 12y = e^{-2x}$.
20. Solve $\frac{d^2y}{dx^2} + 16y = -4 \cos 4x$.
21. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = x^2$.
22. Find the Laplace transform of the function $f(t) = t$; if $t \geq 2$ and 0, if $t < 2$.
23. Solve $y'' + 3y' + 2y = r(t) = u(t-1) - u(t-2)$, $y(0) = 0$, $y'(0) = 0$.



PART – D
(Long Essay)

Answer **any two** questions from this Part. **Each** question carries **6** marks.

(2×6=12)

24. Solve $\left(\frac{3-y}{x^2}\right)dx + \left(\frac{y^2-2x}{xy^2}\right)dy = 0$, $y(-1) = 2$ by exactness.

25. Solve the initial value problem $(y + \sqrt{x^2 + y^2})dx - xdy = 0$, $y(1) = 0$.

26. Solve $x^2y'' - 2xy' + 2y = 0$, $y(1) = 1$, $y'(1) = 1$.

27. Using Laplace transform, solve $y'' + 4y' + 3y = e^{-t}$, $y(0) = y'(0) = 1$.

PART – B
(Short Essay)

Answer any eight questions. Each question carries 2 marks.

1. Solve the initial value problem $y' = 6y$, $y(0) = 2$.

2. Does the initial value problem $xy' = y - 1$ has a unique solution? Justify.

3. Solve the IVP $y' = -4x/y$, $y(2) = 3$.

4. Find the general solution of $y' + 4y = e^{-x}$.

5. Find the general solution of $xy'' - 2y' = 2x + 1$.