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 $\frac{d^2y}{dx^2} + y = 0$.

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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. (4×4=16)

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 $\left(y + \sqrt{x^2 + y^2}\right)dx - xdy = 0, \ y(1) = 0$.

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

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

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