Reg. No.:

Name :

V Semester B.Sc. Degree (CBCSS - OBE - Regular/Supplementary/ Improvement) Examination, November 2024 (2019 to 2022 Admissions) CORE COURSE IN MATHEMATICS

5B08 MAT : Differential Equations and Laplace Transforms

Time: 3 Hours

Max. Marks: 48

(Short Answer)

PART - A

Answer any four questions from this Part. Each question carries 1 mark. (4x1=4)

- Define an ordinary differential equation.
- 2. For what values of the constant m will $y = e^{mx}$ be the solution of y'' 3y' 10y = 0.
- 3. Write the characteristic equation of $3\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^3} = x^2$. Write the integrating factor of Mdx + Ndy = 0.
- 5. Find the inverse Laplace transform of $\frac{1}{2}$. PART - B

(Short Essay)

-2-

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

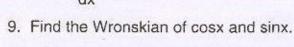
6. Solve $y' + (x+2)y^2 = 0$.

7. Find the order and degree of $x^2 \frac{d^3y}{dx^3} + 12x \left(\frac{dy}{dx}\right)^{\frac{1}{2}} = 6$.

P.T.O.

8. Solve $\frac{dy}{dx} = xy + x$.

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State the uniqueness theorem of first order differential equation.

- 11. Find the basis of the solution of the equation $\frac{d^2y}{dx^2} + y = 0$.
- 12. Find the general solution of $\frac{d^2y}{dy^2} 4y = 0$.
- 13. Find the Wronskian of ex and e-x.
- 14. Find $L^{-1} \left| \frac{1}{(s+1)(s+2)} \right|$.

15. Find the convolution of t and e^{-t}.

16. Evaluate $L^{-1} = \frac{2}{(s+4)^3}$.

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

PART - C (Essay)

18. Find the orthogonal trajectories of the family $x^2 - y^2 = c$.

20. Solve
$$\frac{d^2y}{dx^2} + 25y = 2\sin 5x$$

19. Solve $\frac{d^2y}{dx^2} - 13\frac{dy}{dx} + 12y = e^{-2x}$.

23. Find the Laplace transform of the function f(t) = t; if $t \ge 2$ and 0, if t < 2.

21. Solve $\frac{d^2y}{dx^2} - y = 3 + 2x^2$.

PART - D

(Long Essay)

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Answer any two question from this Part. Each question carries 6 marks. 24. Solve the initial value problem $\left(y + \sqrt{x^2 + y^2}\right) dx - xdy = 0$, y(1) = 0. 25. Check the exactness and solve $(2xy^2 + y)dx + (2y^3 - x)dy = 0$.

26. Solve $y'' - 3y' + 2y = 2x^2 + e^x + 2xe^x + 4e^{3x}$.

22. Find the Laplace transform of the integral te-4t sin3tdt

27. If L[f(t)] = F(s), then show that $L[f(t-a) u(t-a)] = e^{-as}F(s)$.

 $(2 \times 6 = 12)$

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