K26FY0452 Pages: 2 Reg No:.....
Name:.....

Fourth Semester FYUGP Degree (Reg) Examination April 2026

KU4DSCMAT203 - ORDINARY DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

2024 Admission onwards

Time : 2 hours Maximum Marks : 70

Section A

Answer any 6 questions. Each carry 3 marks.

1. Write the explicit form of first order ordinary differential equation.
2. Solve the ODE: $\frac{dy}{dx} = \frac{1}{1+x^2}$ by integration.
3. State Second Shifting theorem.
4. Find the Laplace transform of $1 * e^{at}$
5. Write the convolution of two the constant functions $f(t) = 2$ and $g(t) = 3$.
6. Find $(D^2 + 2I)\cosh 2x$.
7. If α and β are the roots of the characteristic equation of a second order linear homogeneous differential equation with constant coefficients, find its general solution.
8. Define the Wronskian of the functions y_1 and y_2.

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Section B

Answer any 4 questions. Each carry 6 marks.

9. Find the inverse transform $f(t)$ of $\frac{e^{-4s}}{s^3}$.
10. Solve the IVP; $y'' + 4y' + 5y = \delta(t-1), y(0) = 0, y'(0) = 3$.
11. Find $(f * g)(t)$ when $f(t) = 1$ and $g(t) = \sin \omega t$.
12. Solve $y'' + 9y = \sec 3x$ by variation of parameters.
13. Solve $x^2y'' + 3xy' + y = 0$.
14. If y_1 is a solution of $y'' + p(x)y' + q(x)y = r(x)$ and y_2 is a solution of $y'' + p(x)y' + q(x)y = 0$, show that $y_1 + y_2$ is a solution of the former.

Section C

Answer any 2 questions. Each carry 14 marks.

15. a) Find the Laplace transform of the following functions:

$$(i)\ \ \sinh t \cos t. \quad (ii)\ e^{-t}(\cos 3t - \sin 3t).$$

b) Evaluate $\mathscr{L}^{-1}\left[\dfrac{s^2+2s+3}{(s^2+2s+2)(s^2+2s+5)}\right]$.

16. Solve the following initial value problem by the Laplace transform.

(a) $y'' - 4y' + 4y = 0,\ y(0) = 8.1,\ y'(0) = 3.9.$

(b) $y'' + 9y = 10e^{-t},\ y(0) = 0, y'(0) = 0.$

17. (a) Solve $x(x-y)y' + y^2 = 0$ by the substitution $u = y/x$.

(b) Make the following equation exact and hence solve $(x^2+y^2)dx - 2xydy = 0$.

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