

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End-Term Examination (Backlog), May 2025
B. Tech., Even Semester, 2024-25

Roll No.....

AS1405: Ordinary Differential Equations and Laplace Transforms

Time: 2 hours Max. Marks: 30

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. Specify, if you find any ambiguity in the questions. Justify and solve the question after removing that ambiguity.
3. Answer correctly to four decimal places in case of no specific mention of the requirement.
4. Mention the formula for each method you use to solve the problem.
5. You may use a calculator for the necessary calculation.

- Q.1. Find the Laplace transforms of the following functions. 6.0
(C03)
- a) $\cos^2(3t) + \sin^2(3t)$
b) $4t^3 e^{-2t}$
c) $2e^t \cos 3t$
- Q.2. Use the Laplace transform of the second derivative to derive the following 5.0
(C03)
- transform.
 $\mathcal{L}\{\cos at\} = \frac{s}{s^2 + a^2}$
- Q.3. Find $\mathcal{L}^{-1}\left\{\ln \frac{s^2+1}{s^2+4}\right\}$. 4.0
(C03)
- Q.4. Use the Laplace transform to solve the differential equation: 7.0
(C01, 3)
- $\frac{d^2 y}{dx^2} + 4 \frac{dy}{dx} + 4y = 4e^{-2t}$ given that when $x = 0, y = 1$ and $\frac{dy}{dx} = 0$.
- Q.5. Given $\frac{dy}{dx} = 3x + \frac{y}{2}, y(0) = 1$. Find $y(0.1)$ correct to four decimal places using 8.0
(C01)
- Runge Kutta fourth order method taking $h = 0.1$