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**G H Raison College of Engineering and Management, Pune**  
(An Empowered Autonomous Institute affiliated to Savitribai Phule, Pune University, NAAC Accredited "A+" Grade)  
First Year B. Tech.

**CAE I / Term II / AY 2025-26 (2023 Pattern)**  
**Integral Calculus and Differential Equations (23UBSL1203)**

(Time: - 01 Hour)

(Max. Marks: 20)

Instructions to the students:

- i) All questions are compulsory.
- ii) Calculator is not allowed
- iii) Figures to the right indicate full marks.

| Question No |                                                                                                                       | Marks | CO  | BL |
|-------------|-----------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| Q.1 a)      | Solve $\int_0^1 (x \log x)^4 dx$                                                                                      | [04]  | CO1 | L3 |
| OR          |                                                                                                                       |       |     |    |
| Q.1 b)      | Explain any four properties of Gamma Function and solve $\int_0^{\infty} x^7 e^{-2x^2} dx$                            | [04]  | CO1 | L3 |
| Q.1 c)      | Prove that: $\int_0^{\pi/2} \sqrt{\tan \theta} d\theta \int_0^{\pi/2} \sqrt{\cot \theta} d\theta = \frac{\pi^2}{2}$ . | [06]  | CO1 | L3 |
| OR          |                                                                                                                       |       |     |    |
| Q.1 d)      | Verify DUIS Rule for the integral $I(a) = \int_0^{\pi/2} \sin ax dx$ .                                                | [06]  | CO1 | L3 |
| Q.2 a)      | Solve $\int_0^1 \int_{y^2}^y (1 + xy^2) dx dy$                                                                        | [04]  | CO1 | L3 |
| OR          |                                                                                                                       |       |     |    |
| Q.2 b)      | Show that: $\int_0^1 \int_{x^2}^x xy(x+y) dx dy = \frac{3}{56}$ .                                                     | [04]  | CO1 | L3 |
| Q.2 c)      | Solve $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dx dy$ by changing the order of integration.                  | [06]  | CO1 | L3 |
| OR          |                                                                                                                       |       |     |    |
| Q.2 d)      | Solve $\int_0^1 \int_0^{2-x} xy dx dy$ by changing the order of integration.                                          | [06]  | CO1 | L3 |

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BL – Bloom's Taxonomy Levels (1- Remember, 2- Understand, 3 – Apply, 4 – Analyze, 5 –Evaluate 6 - Create