D 143405 **(Pages : 2)** Name.............................

Reg. No...............................

SECOND SEMESTER B.Voc. DEGREE EXAMINATION, APRIL 2026

Data Science and Analytics

SDC 2D S 06—MATHEMATICS FOR DATA SCIENCE

(2021 Syllabus)

Time : Two Hours Maximum : 60 Marks

Section A

All *questions can be answered.*
Each question carries 2 *marks. (Ceiling* : 20 *marks)*

1. Let A = {1, 3, 5, 7}, B = {2, 3, 4, 5}. Find A ∪ B and A ∩ B.
2. Prove that every non-empty subset of $\mathbb{R}$ that is bounded above has a least upper bound.
3. Define the limit of a sequence.
4. Prove that the sequence $\left\{\frac{1}{n}\right\}$ is convergent.
5. Define a Cauchy sequence.
6. State any one test for absolute convergence.
7. Define derivative of a fucntion at a point.
8. State the Mean Value Theorem.
9. Write Maclaurin's series for sin x up to three terms.
10. Define upper and lower Riemann integrals.
11. State the applications of Laplace transform to ordinary differential equations.
12. Evaluate the improper integral $\int_0^1 \frac{1}{\sqrt{x}}$.

(Ceiling : 20 marks)

Section B

All *questions can be answered.*
Each question carries 5 *marks. (Ceiling* : 30 *marks)*

13. Let (x_n) be a sequence. Prove that if (x_n) is monotone and bounded, then it converges.
14. Test the series $\Sigma \frac{n}{n^2+1}$ for convergence.

Turn over

15. Prove that if $\sum|a_n|$ converges, then $\sum a_n$ converges.
16. If f is differentiable at c, prove that f is continuous at c.
17. Apply Taylor's theorem to expand sin x around $x = 0$ up to the term containing x^3.
18. State and prove the Fundamental Theorem of Calculus.
19. Find L{sin at} and use Laplace transform to solve $y' + 2y = e^{-t}, y(0) = 0$.

(Ceiling : 30 marks)

Section C

Answer any **one** *question.*
The question carries 10 *marks.*

20. (a) State and prove nested interval property.

    (b) Discuss the convergence of the alternating series $\sum \frac{(-1)^{n+1}}{n}$.

21. (a) Explain Riemann integrability with an example of a function that is Riemann integrable and one that is not.

    (b) Using Laplace transform, solve $y'' - 3y' + 2y = 0$ with $y(0) = 0$, $y'(0) = 1$.

(1 × 10 = 10 marks)