CHENNAI MATHEMATICAL INSTITUTE

M.Sc. Data Science Entrance Examination 2025

24th May 2025

Enter your *Admit Card Number*: **D** – ☐☐☐ – ☐☐☐☐

IMPORTANT INSTRUCTIONS

- This booklet consists of 24 pages, including this cover page. Page 3 contains space to write solutions to Part A. Pages 4 to 13 contain space to answer the questions in Part B. Pages 14 to 24 are meant for rough work.
- Part (A) consists of multiple-choice questions. There may be multiple correct choices. You have to select all the correct options and no incorrect option to get full marks. For instance, if you believe the correct options are (a) and (c), choose only (a) and (c). **There is no partial credit.**
- For questions in part (B), you have to write your answer in this answer booklet in the space provided for the question, along with a short explanation.
- **Part(A) will be used for screening.** Part (B) will be graded only if you score a certain minimum in part (A). However your scores in both parts will be used while making the final decision.
- **Time allowed is 3 hours, 30 minutes. Total points: 100** = 40 for part A + 60 for part B.
- For numerical answers, the following forms are acceptable: fractions, decimals, symbolic e.g.: $\binom{n}{r}$, ${}^nP_r$, $n!$ etc.

For office use only

	Points	Remarks
Part A		
Part B		
Total		

B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	Total
B11	B12	B13	B14	B15	B16	B17	B18	B19	B20	Total

Notation and terminology

- A function f from a set A to a set B is said to be **injective (or one-to-one)** if $f(x) = f(y)$ implies $x = y$ for all $x, y \in A$;
- f is said to be **surjective (or onto)** for every $y \in B$ there exists $x \in A$ such that $f(x) = y$;
- f is said to be **bijective** if it is both injective and surjective;
- f is said to be **invertible** if there exists a function g from B to A such that $f(g(y)) = y$ for all $y \in B$ and $g(f(x)) = x$ for all $x \in A$.
- For a matrix A, A^T denotes the transpose of A. For a square matrix A, $|A|$ denotes the determinant of A and trace(A) denotes the *trace* of A — namely the sum of the diagonal elements of A.
- A *diagonal matrix* is a square matrix D with all off-diagonal entries equal to zero i.e. $d_{ij} = 0$ for all $i \neq j$.
- An *upper triangular matrix* is a square matrix A for which all entries below the diagonal are zero, i.e. $a_{ij} = 0$ for $i > j$.
- A *symmetric matrix* is a square matrix S for which $s_{ij} = s_{ji}$ for all $i \neq j$.

Answers to part A

This is the only place that will be seen for grading part A. So carefully and clearly write the answers to each question on the designated line below. Write only the correct options, do not show any intermediate work. Illegible/unclear answers will not be considered. ×

A1. _____ A2. _____

A3. _____ A4. _____

A5. _____ A6. _____

A7. _____ A8. _____

A9. _____ A10. _____

A11. _____ A12. _____

A13. _____ A14. _____

A15. _____ A16. _____

A17. _____ A18. _____

A19. _____ A20. _____

Part B

For questions in part (B), you have to write your answer with a short explanation in the space provided below. For numerical answers, the following forms are acceptable: fractions, decimals, symbolic e.g.: $\binom{n}{r}$, ${}^nP_r$, $n!$ *etc.*

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(1)

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(2)

(3)

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(4)

(5)

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(6)

(7)

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(8)

(9)

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(10)

(11)

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(12)

(13)

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(14)

(15)

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(16)

(17)

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(18)

(19)

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(20)

Rough work

Rough work

Rough work

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