

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

May-June 20__ / Jan-Feb 2026 / July-Aug 20__ / Feb- March 20__		
(M. Tech.) Program: Artificial Intelligence Scheme II		
Regular/Supplementary	Examination: FY	Semester: I
Course Code: PCEC103	Course Name: Mathematical Foundation of Data Science	Max. Marks: 60
Date of Exam: 12/01/2026	Duration: 02.5 Hours	

Instructions:

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any two questions out of three: (05 marks each)	10		
a)	Discuss about the role of Mathematics in Data Science.		CO1	U
b)	Define expectation and variance. Compute the expectation of X with probability distribution: X: 1, 2, 3 P(X): 0.2, 0.5, 0.3		CO3	U, AP
c)	Define a hypothesis test. What are Null Hypothesis (H_0) and Alternative Hypothesis (H_1)?		CO5	U
Q 2	Solve any two questions out of three: (05 marks each)	10		
a)	For the following matrices and vectors, determine the transpose of a matrices: $B = \begin{pmatrix} 2 & -3 & -4 \\ 5 & -6 & -7 \\ -8 & 9 & 0 \end{pmatrix} \quad M = \begin{pmatrix} -1 & 2 \\ -3 & 6 \\ 7 & -9 \\ 5 & -1 \end{pmatrix} \quad x = \begin{pmatrix} 3 \\ -4 \\ 5 \\ 6 \end{pmatrix}$		CO2	Ap
b)	Explain the Bootstrap method. How can it be used to estimate confidence intervals?		CO4	U
c)	Differentiate between global and local optima with examples.		CO6	An
Q.3	Solve any two questions out of three. (10 marks each)	20		
a)	Discuss about various formulas in Probability and Statistics.		CO1	U
b)	What is transpose of a matrix or vector. Explain with example.		CO2	U
c)	Discuss covariance and correlation. Given the data: X: 2, 4, 6, 8 Y: 3, 6, 9, 12 Compute correlation and interpret.		CO3	Ap

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Q.4	Solve any two questions out of three. (10 marks each)	20		
a)	Explain the Binomial, Poisson, Exponential, and Weibull distributions with one practical application each.		CO4	An
b)	Explain ANOVA. How does it help compare multiple groups? Give an example.		CO5	U, AP
c)	Explain the Lift metric. Why is it used in classification models? Give an example.		CO6	U, Ap
