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

I PCECI(B) MFDS	Nov – Dec 2022 **M.Tech. Artificial Intelligence** Examination: FY Semester: I	
Date of Exam: 24-02-2023	Duration: 2.30 Hours	Max. Marks: 60

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data if required, and state it clearly.

		Max. Marks	CO	BT Level
Qu-1	Solve any **Six** questions out of **Eight.**	12		
i)	What is an exploratory analysis of categorical data?	2	CO3	R
ii)	What are the conditions of the Central Limit Theorem?	2	CO4	R
iii)	How do you solve singular value decomposition?	2	CO2	R
iv)	A random variable X has an exponential distribution with a probability distribution function given by $f(x) = 3e^{-3x}$ for $x > 0 = 0$ otherwise. Find the probability that X is not less than 2.	2	CO4	A
v)	If 'X' is a random variable, taking values 'x', probability of success and failure being 'p' and 'q' respectively and 'n' trials being conducted, then what is the probability that 'X' takes values 'x'? Use Binomial Distribution.	2	CO4	A
vi)	Explain the importance of linear algebra in data science?	2	CO1	U
vii)	What is lift metric in classification problems?	2	CO6	R
viii)	How large does the sample size need to be for the normal approximation to occur?	2	CO5	U
Qu-2	Solve any **Four** questions out of **Six.**	16		
i)	A study was set up to look at whether there was a difference in the mean arterial blood pressure between two groups of volunteers, after 6 weeks of following one of two treatment programs. One group of volunteers were given an exercise regimen to follow for the 6 weeks and the other group were given the same exercise regimen with the addition of an experimental tablet. Which type of t-test should be used in this situation? And why?	4	CO5	A
ii)	Explain global and local optima with graphical representation.	4	CO6	U
iii)	Justify the need of statistics from a data science perspective.	4	CO1	U
iv)	Explain Correlation matrix with example.	4	CO3	U
v)	The average number of major storms in your city is 2 per year. What is the probability that exactly 3 storms will hit your city next year?	4	CO4	U

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vi)	What is Cholesky factorization? Discuss applications of Cholesky factorization.	**4**	CO2	U
Qu-3	Solve any **Two** questions out of **Three.**	**16**		
i)	Why do we need Poisson distribution? How do you solve Poisson distribution? Explain with example	**8**	CO4	U
ii)	Explain univariate analysis, bivariate analysis, and multivariate analysis with suitable examples.	**8**	CO3	U
iii)	When constructing and implementing hypothesis tests, what reasoning is used behind the statement of the null and alternative hypotheses? Why are hypothesis tests set up in this way? How do you find the p value in hypothesis testing? Clarify with an example.	**8**	CO5	A
Qu-4	Solve any **Two** questions out of **Three.**	**16**		
i)	Explain structured thinking for solving data science problems.	**8**	CO1	U
ii)	Calculate Eigenvalue and Eigenvector for the given matrix. $$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 4 & 9 \end{bmatrix}$$	**8**	CO2	A
iii)	Explain unconstrained and constrained optimization.	**8**	CO6	U

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