Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 27-10-2025 **Time:** 11.00am to 12.30pm

School: SOE/SOCSE	**Program:** B.TECH, (CSE)	
Course Code : CSD3403	**Course Name:** Optimization Techniques For Data Science	
Semester: VII	**Max Marks**: 50	**Weightage**: 25%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**24**	**26**	**-**	**-**	**-**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **5Q x 2M=10M**

1	Calculate L1 and L2 norm of given vector v = (0, -4, 5, -1).	**2 Marks**	**L1**	**CO1**
2	Define a vector and what is vector space.	**2 Marks**	**L1**	**CO1**
3	Write the first order & second order Optimality Conditions.	**2 Marks**	**L1**	**CO2**
4	Define Gradient, Hessian in the context of Optimization.	**2 Marks**	**L2**	**CO2**
5	Differentiate between a local maximum and a global maximum of a function.	**2 Marks**	**L2**	**CO2**

Part B

Answer the Questions. **Total Marks 40M**

6.	**a.**	What are convex sets and convex functions explain with a an example. What is the difference between convex and non-convex optimization problems	**10 Marks**	**L3**	**CO1**
		Or			

7.	**a.**	Comment on solution for the system of linear equations and solve for the solution if it exists. $x + 2y + 3z = 6$ $2x + 4y + 6z = 12$ $-3x - 6y - 9z = -18$	**10 Marks**	**L2**	**CO1**

8.	**a.**	Derive the first order and second order necessary conditions for optimality of a differentiable function.	**10 Marks**	**L2**	**CO 1**
		Or			
9.	**a.**	Find the stationary points and determine their nature (maxima, minima or saddle) for $f(x) = x^2 + y^2 - 4x - 6y + 13$	**10 Marks**	**L3**	**CO 1**

10.	**a.**	Given the function $f(x,y) = x^2 + 3y^2 - xy - 10x$ and initial point $(x_0, y_0) = (0,0)$ using newtons method, find the maxima of the given function using weights updation (Learning rate =1)	**10 Marks**	**L3**	**CO 2**
		Or			
11.	**a.**	Write a short note on RMSProp and Adam Optimizers.	**10 Marks**	**L2**	**CO 2**

12.	a. b.	Write a short note on Quasi – Newton methods (BFGS, L-BFGS) and its advantages over newtons method Define step size and Line Search.	**10 Marks**	**L2**	**CO 2**
		Or			
13.	**a.**	Explain Gradient Descent on a non-symmetric quadratic function $f(x,y) = x^2 + xy + y^2$ and compute **(i)** gradient at (x_0, y_0) **(ii)** new point (x_1, y_1) **(iii)** function value $f(x_1, y_1)$, where initial point $(x_0, y_0) = (2,1)$ and learning rate = 0.1	**10 Marks**	**L3**	**CO 2**