JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech-VII Semester (CSE)

COURSE CODE (2): 25B1WCI738 MAX. MARKS: 15

COURSE NAME: Optimization in Machine Learning

COURSE INSTRUCTOR: Dr. Rohit Pal Singh MAX. TIME: 1 Hour

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculator is allowed

UNIT-TEST-1 EXAMINATION- AUG-2026

Q.No	Question	CO	Marks
Q1	Determine which of the following functions are convex and which are concave. Justify your answer using the second derivative test. 1. $f(x)=x^2$ 2. $f(x)=-x^2+4x$ 3. $f(x)=e^x$	CO1	2
Q2	What are first and second order convexity conditions.	CO1	2
Q3	What are Support Vector Machine? How are separating hyperplane defined in SVM?	CO1	2
Q4	Find the singular values of the matrix $A=\begin{bmatrix} 0 & 1 & 1 \\ \sqrt{2} & 2 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ and determine its Singular Value Decomposition (SVD), i.e., express A in the form $A=U\Sigma V^T$.	CO2	4
Q5	Explain the concepts of linear programming and quadratic programming, and discuss the limitations of the graphical method of solving optimization problems. Then, solve the following problem using the simplex method. Consider the following scenario: A small manufacturing unit in Pune produces three items — chairs (x), tables (x), and desks (x) — earning a profit of ₹30, ₹50, and ₹40 per unit, respectively. The factory operates under three limiting resources: 1. Labour hours: Each chair requires 4 hours, each table requires 6 hours, and each desk requires 5 hours of labour. A total of 240 labour hours are available. 2. Raw material (in square feet): Each chair requires 3 sq ft, each	CO2	5

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	table requires 8 sq ft, and each desk requires 6 sq ft of raw material. A total of 200 sq ft of raw material is available. 3. Machine time: Each chair requires 2 hours, each table requires 3 hours, and each desk requires 4 hours of machine time. A total of 120 machine hours are available. Formulate this as a linear programming problem and determine the optimal number of chairs, tables, and desks the factory should produce to maximize profit, using the simplex method.		

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