JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.C.A.-III Semester (AIDS)

COURSE CODE (CREDITS): 25BCWMA331 (3) MAX. MARKS: 15

COURSE NAME: OPTIMIZATION FOR DATA SCIENCE

COURSE INSTRUCTOR: SST 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 a scientific calculator is allowed.

Q. No.	Question	CO	Marks
Q1	For the function $f(x,y) = x^2 + 3xy + 2y^2 - 4x + 5y$, evaluate the following: **a)** Gradient vector of $f(x,y)$ at (1,2). **b)** Hessian matrix of $f(x,y)$ at (1,2). **c)** Directional derivative of $f(x,y)$ at (1,2) in the direction of the vector $\vec{v}^T = (1,1)$.	1	3
Q2	Obtain the second-order Taylor approximation of $f(x,y) = e^x \cos y$ about the point (0,0). Use the approximation to estimate $f(0.1,0.2)$.	1	3
Q3	Consider the data points (1,2), (2,3), (3,5). Fit the linear model $y = a + bx$ using the least squares method by minimizing, $S(a,b) = \sum_{i=1}^{3}(y_i - a - bx_i)^2$.	1	3
Q4	Solve the following linear programming problem using the graphical method: $Maximize\ Z = 3x + 5y$ $subject\ to$ $2x + y \leq 8,$ $x + 2y \leq 8,$ $x, y \geq 0.$ Determine the feasible region, corner points, and optimal solution.	2	3

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Q5	Solve the following problem using the simplex method: $$Maximize\ Z = 3x + 2y$$ $$subject\ to$$ $$x + y \leq 4,$$ $$2x + y \leq 5,$$ $$x, y \geq 0.$$ Construct the initial simplex tableau and perform the required iterations to obtain the optimal solution.	**2**	**3**

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