JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech-I Semester

COURSE CODE (CREDITS): 18B11MA111 (4) MAX. MARKS: 15

COURSE NAME: ENGINEERING MATHEMATICS I

COURSE INSTRUCTOR: RKB* 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 calculators is not allowed

Q. No	Question	CO	Marks
Q1	In a database query optimizer, suppose that the cost function of executing a query is modeled implicitly by the relation $$xz + ylogx - x^2 - 4 = 0,$$ where x represents the number of indexing operations, y represents query depth (number of joins), and z represents the data block size. Find the sensitivity/rate of change of the indexing operations x with respect to changes in the data block size z at the point (1, -1, -3).	CO-1	3
Q2	Using Chain rule, evaluate $\frac{\partial w}{\partial u}$ and $\frac{\partial w}{\partial v}$ at the given point (u, v), where $w = xy + yz + xz, x = u + v, y = u - v$ and $z = uv$, $(u, v) = \left(\frac{1}{2}, 1\right)$.	CO-1	3
Q3	Use Taylor's series at the origin to find cubic approximation of the function $f(x, y) = \sin(x^2 + y^2)$.	CO-2	3
Q4	Consider a simple two-parameter model with parameters x and y. The loss surface is $$f(x, y) = x^2 + xy + y^2 - 3x.$$ (a) Find all critical points of f. (b) Determine whether each critical point is a local minimum, local maximum, or saddle point.	CO-2	3
Q5	Using the method of Lagrange's multiplier, find the extreme values of $f(x, y) = x^2 + y^2$ subject to $3x^2 + 4xy + 6y^2 = 140$.	CO-2	3

(3)