JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

T-1, EXAMINATION- 2023

B. Tech. I Semester (CSE/IT/ECE/CE)

COURSE CODE (CREDITS): 18B11MA111 (04)　　　　　　　MAX. MARKS: 15

COURSE NAME: ENGINEERING MATHEMATICS-I

COURSE INSTRUCTORS: RKB, KAS, NKT, BKP, PKP, MDS*　　　MAX. TIME: 1 Hrs.

Note: All questions are compulsory. Marks are indicated against each question in square brackets. Use of scientific calculator is not allowed.

Quest.(1) Let $f(x,y) = \frac{x^2-y^2}{x^2+y^2}$ for $(x,y) \neq (0,0)$. Is it possible to define $f(0,0)$ in a way that makes f continuous at the origin? Why?　　　　[3] [CO-1]

Quest.(2) If $u = \log(\tan x + \tan y + \tan z)$ then find the value of　　[3] [CO-1]
$$\sin 2x \, \frac{\partial u}{\partial x} + \sin 2y \, \frac{\partial u}{\partial y} + \sin 2z \, \frac{\partial u}{\partial z}.$$

Quest.(3) Find all critical points of $f(x,y) = 2x^3 + y^2 - 6xy + 4y$ and classify them as local minimum, local maximum, or saddle points (if they exist).　　　[3] [CO-1]

Quest.(4) The temperature T at any point (x, y, z) in space is $T = 400xyz^2$. Find the highest temperature on the surface of the unit sphere $x^2 + y^2 + z^2 = 1$ using Lagrange's method.　　　　[3] [CO-2]

Quest.(5) Obtain the Taylor's series expansion of the maximum order for the function
$$f(x,y) = x^2 + 3y^2 - 9x - 9y + 26,$$
about the point (2, 2).　　　　[3] [CO-2]