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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2025

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

COURSE CODE (CREDITS): 25B11MA113 MAX. MARKS: 15

COURSE NAME: MATHEMATICS I

COURSE INSTRUCTORS: PKP*, MDS, NKT, 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) Any type of calculator is not allowed.

Q.No.	Question	CO	Marks
Q1	1. (a) In a robotic path planning the robot's position error is given by the function $f(x,y) = \frac{x^2y-y^3+\cos(xy)}{x^2+y^2+1}$. Compute $\lim_{(x,y)\to(0,-1)} f(x,y)$. (b) Suppose in a color transformation (of an image) the brightness of a pixel is given by $B(r,g,b) = \sqrt{r^2+g^2+b^2}$. Compute the numerical value of $\frac{\partial B}{\partial g}$ at $(r,g,b) = (2,3,6)$.	1	2+2
Q2	(a) Suppose that a program's execution time depends on CPU cycles (x) and the memory usage (y) modeled by the equation $T(x,y) = x^2 + y^2$; where $x = p^2 - 1$ (CPU cycles depending on input parameter p) and $y = p^3 - p$ (memory usage depending on input parameter p). Use *Chain rule of partial differentiation* to find the total derivative $\frac{dT}{dp}$; i.e., how execution time changes as we change the input parameter p. (b) If $z = \sin(xy) + e^{xy}$, then find the value of $\frac{\partial z}{\partial x}$ & $\frac{\partial z}{\partial y}$.	1	2+2
Q3.	If $u = \sec^{-1}\left(\frac{x^3-y^3}{x-y}\right)$, then find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = ?$	1	3
Q4.	Obtain Taylor series expansion of $f(x,y) = x^2y + 3y - 2$ in powers of $(x-1)$ and $(y+2)$ up to third degree terms.	1	4

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