JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -1 EXAMINATION- 2026
BCA -III Semester (AIML)

COURSE CODE (CREDITS): 25BCWMA332 MAX. MARKS: 15
COURSE NAME: MULTIVARIATE CALCULUS IN ML
COURSE INSTRUCTOR: MDS 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 not allowed

Q.No	Question	CO	Marks
Q1	A machine-learning objective function is $$f(x,y)=\begin{cases}\dfrac{x^2+2xy-y^2}{x^2+y^2}, & (x,y)\neq(0,0),\\ 0, & (x,y)=(0,0),\end{cases}$$ (a) Investigate the limit along $y=x$. (b) Investigate the limit along $y=-x$. (c) Determine whether the function $f(x,y)$ is continuous at (0,0). Justify your answer.	CO-1	3
Q2	The loss function of a simplified machine-learning model is $L(x,y)=x^2+2xy+3y^2$. The parameters depend on time t as $x=t^2$, $b=e^t$. (a) Find the partial derivatives $\frac{\partial L}{\partial x}$ and $\frac{\partial L}{\partial y}$. (b) Using the chain rule, determine $\frac{dL}{dt}$ and evaluate its value at $t=0$.	CO-1	3
Q3	If $u=\cos^{-1}\left(\frac{3xy}{x^4+y^4}\right)$, then by using Euler's theorem, find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=?$	CO-1	3
Q4	A temperature field is given by $T(x,y,z)=x^2+y^2+z^2$. At the point $P(1,2,2)$, find: (a) The gradient vector $\vec{\nabla}T$. (b) The directional derivative in the direction $\vec{v}=2\hat{\imath}-\hat{\jmath}+2\hat{k}$. (c) The maximum rate of increase of temperature at P.	CO-1	3
Q5	Find all values of the constant c so that $\int_0^1\int_0^c(2x+y)dxdy=3$.	CO-2	3

JUIT TEST-1 EXAMINATION-AUG-2026