

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS- 2026

B.Tech-II Semester (BT/BI)

COURSE CODE (CREDITS): 25B11MA212

MAX. MARKS: 25

COURSE NAME: MATHEMATICS FOR LIFE SCIENCES-II

COURSE INSTRUCTOR: MDS

MAX. TIME: 1 Hour 30 Min

- 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) Test the convergence of the following series using the <i>Integral test</i> : $\sum_{n=1}^{\infty} \frac{5}{n+1}$ (b) The signal strength is modeled by the infinite series: $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{n^2+1}$ Examine whether the given series is <i>absolutely convergent</i> or <i>conditionally convergent</i> .	CO-1	3+3
Q2	(a) In a metabolic pathway, the output rate is given by $w = xy + y^2$ where $x$ and $y$ represent metabolite concentrations. These depend on environmental parameters $u$ and $v$ as $x = u^2 + v$ and $y = u + v^2$ . Using the <i>chain rule</i> , find $\frac{\partial w}{\partial u}$ and $\frac{\partial w}{\partial v}$ . (b) If $u = \tan^{-1} \left( \frac{x^3+y^3}{x+y} \right)$ , then show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$ .	CO-2	2+3
Q3	(a) Find the local extreme values of $f(x, y) = 3y^2 - 2y^3 - 3x^2 + 6xy$ (b) Discuss the continuity of the following function $f(x, y) = \begin{cases} \frac{(x-y)^2}{x^2+y^2}, & (x, y) \neq (0,0) \\ 0, & (x, y) = (0,0) \end{cases}$ at $(0,0)$ .	CO-2	3+2
Q4	Using <i>Taylor's series</i> , expand $f(x, y) = e^{2x} \cos 3y$ in power of $x$ and $y$ up to second degree terms.	CO-2	3
Q5	(a) Solve $\frac{dy}{dx} + \frac{1}{x} y = x^4 - 3x^2 + 7$ (b) Solve the Bernoulli's equation $x \frac{dy}{dx} + y = x^3 y^6$	CO-3	3+3