

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST - 1 EXAMINATIONS-2025

B.Tech-V Semester

COURSE CODE (CREDITS): 20B1WCI531

MAX. MARKS: 15

COURSE NAME: FOUNDATION FOR DATA SCIENCE AND VISUALIZATION

COURSE INSTRUCTORS: RBT

MAX. TIME: 1 HOUR

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q.No	Question	CO	Marks
Q1	<p>a) Show that the arithmetic mean equals the geometric mean when all terms are the same.</p> <p>b) Classify the following attributes as binary, discrete, or continuous. Also classify them as qualitative (nominal or ordinal) or quantitative (interval or ratio)</p> <p>i) Angles as measured in degrees between 0degree and 360 degrees.</p> <p>ii) ISBN numbers for books</p> <p>iii) Military tank</p> <p>iv) Distance from center of campus</p>	1	1+ 2
Q2	<p>Briefly outline how to compute the dissimilarity between objects described by the following (ANY THREE):</p> <p>(a) Nominal attributes</p> <p>(b) Asymmetric binary attributes</p> <p>(c) Numeric attributes</p> <p>(d) Term-frequency vectors</p>	1	1+ 1+ 1
Q3	<p>Show that if M is a square matrix which is not invertible, then either L or U in the LU-decomposition $M = L \cdot U$ has a zero in its diagonal.</p> <p style="text-align: center;">OR</p> <p>If the $n \times n$ matrix A can be expressed as $A = L U$, where L is a lower triangular matrix and U is an upper triangular matrix, then the linear system $A x = b$ can be expressed as $L U x = b$ and can be solved in two steps:</p> $\begin{bmatrix} 2 & 0 & 0 \\ 4 & 1 & 0 \\ -3 & -2 & 3 \end{bmatrix} \begin{bmatrix} 3 & -5 & 2 \\ 0 & 4 & 1 \\ 0 & 0 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 4 \\ -5 \\ 2 \end{bmatrix}$	6	3

	<p>Step1. Let $U x = y$, so that $L U x = b$ can be expressed as $Ly = b$. Solve this system.</p> <p>Step2. Solve the system $U x = y$ for x.</p> <p>Use this two-step method to solve the given system.</p>		
Q4	<p>Find a singular value decomposition of the matrix</p> $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$	6	3
Q5	<p>Determine whether the statement is true or false, and justify your answer. ($0.5 * 6 = 3$)</p> <p>a) Every eigenvalue of a complex symmetric matrix is real.</p> <p>b) The eigenvalues of a 2×2 complex matrix are the solutions of the equation $\lambda^2 - \text{tr}(A)\lambda + \det(A) = 0$.</p> <p>c) Two equivalent vectors must have the same initial point.</p> <p>d) The vectors $v + (u + w)$ and $(w + v) + u$ are the same.</p> <p>e) If u is a vector and k is a scalar such that $k u = 0$, then it must be true that $k = 0$.</p> <p>f) In every vector space the vectors $(-1)u$ and $-u$ are the same.</p>	6	$0.5 * 6 = 3$