JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

B.Tech-V Semester (CSE/IT)

COURSE CODE (CREDITS): 20B1WCI531 (2)

MAX. MARKS: 35

COURSE NAME: FOUNDATION FOR DATA SCIENCE AND VISUALIZATION

COURSE INSTRUCTORS: RBT , RKI

MAX. TIME: 2 Hours

Note: (a) *All questions are compulsory.*

(b) *The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems*

Q.No	Question	CO	Marks
Q1	Write the procedure for constructing an LU-Decomposition of a square matrix A, assuming this matrix can be reduced to row echelon form without row interchanges. Let square matrix A be $$A = \begin{bmatrix} 4 & 4 & 0 \\ 8 & 6 & 2 \\ -4 & -10 & 8 \end{bmatrix}$$ **OR** Write the steps of LU-Decomposition for Solving Linear Equations. Use the steps and the LU-decomposition $$\begin{bmatrix} 2 & -4 \\ 3 & -2 \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix}$$ to solve the system $$2x_1 - 4x_2 = -4$$ $$3x_1 - 2x_2 = 2$$	6	5
Q2	a) Find the augmented matrix for the following systems of linear equations. $$2x_1 + 2x_3 = 1 , 3x_1 - x_2 + 4x_3 = 7 , 6x_1 + x_2 - x_3 = 0$$ b) The matrix is in row-echelon form, reduced row-echelon form, both, or neither. row1= [1 0 0], row2 = [0 1 0] , row3 = [0 2 0] c) All solution vectors of the linear system $Ax = b$ are orthogonal	6	2 + 2 + 1 = 5 Marks

	to the row vectors of the matrix A if and only if **b** = 0 (True/ False)			
Q3	a) Write the algorithmic steps for solving PCA OR Write the algorithmic steps for solving SVD b) Determine whether the given vectors u =(-1 , 3, 2) and v = (4 , 2 , -1) are orthogonal with respect to the Euclidean inner product.	6	2.5 + 2.5 = 5 Marks	
Q4	a) Consider the vectors u = (1 , 2 , -1) and v = (6 , 4, 2) in R^3. Show that w = (4 , -1 , 8) is not a linear combination of u and v. b) Verify that rank(A) = rank (A^T)	6	2.5 + 2.5 = 5 Marks	
Q 5	a) What relationship exists between row space, column space , and null space of the matrix? b) Find the eigenvector of the matrix. Row1 =[3 0], row2 = [8 -1]	6	2.5 + 2.5 = 5 Marks	
Q 6	a) Compare each pair of distributions to decide which one has the greater mean and the greater standard deviation. You do not need to calculate the actual values of μ and σ, just how they compare with each other. 3, 5, 5, 5, 8, 11, 11, 11, 13 and 3, 5, 5, 5, 8, 11, 11, 11, 20. b) What is the test statistic used to test the significance of difference between small sample mean and population mean. c) Define Type I and Type II errors	5	1 + 2 + 2 = 5 Marks	
Q7	a) Why is exploratory data analysis important in data science? b) A health sensor produces a stream of twenty different values, including blood pressure, heart rate, and body temperature. Describe two or more techniques you could use to check whether the stream of data coming from the sensor is valid. c) Describe some good practices in data visualization?	4	1 + 2 + 2 = 5 Marks	