University of Sargodha

BS 4th Term Examination 2019

Subject: Computer Science **Paper: Linear Algebra (MATH-3215)**

Time Allowed: 2:30 Hours **Maximum Marks: 80**

Note: Objective part is compulsory. Attempt any three questions from subjective part.

Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (16*2)

i. What do you mean by linear algebra?
ii. Differentiate between scalar and vector quantities?
iii. What do you mean by a vector and linear combination?
iv. Define Eigen vector and Eigen values?
v. Differentiate between dot products and length?
vi. How did you classify vector space and subspaces?
vii. What do you mean by a Matrix?
viii. Write down the properties of Determinants?
ix. What is linear programming?
x. What do you mean by Fourier series of a function?
xi. Give a short description on discrete transformation?
xii. What do you mean by Markov matrices?
xiii. What do you mean by a solution?
xiv. Define a complex vector?
xv. What do you mean by orthogonal bases?
xvi. What do you mean by the elimination in matrices?

Subjective Part (3*16)

Q.2. **(a)** Determine the values of a for which the system has no solutions, exactly one solution, or infinitely many solutions.

$x + 2y - 3z = 4,$
$3x - y + 5z = 2,$
$4x + y + (a^2 - 14)z = a + 2.$

(b): Find all the minors and cofactors of the matrix A , where A= $\begin{bmatrix} 4 & -1 & 2 \\ 0 & 0 & 6 \\ 4 & 1 & 4 \end{bmatrix}$.

Q.3. **(a)** Check whether the matrix is in invertible and if so, then uses the adjoint method to find its inverse.

Where A= $\begin{bmatrix} 1 & 3 & 1 & 1 \\ 2 & 5 & 2 & 9 \\ 1 & 3 & 8 & 2 \\ 1 & 3 & 2 & 2 \end{bmatrix}$.

(b): Find the characteristic equation, the Eigen-values, and bases for the Eigen spaces of the matrix A= $\begin{bmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{bmatrix}$.

Q.4. **(a)** Find a matrix P that diagonalyzes A , and check your work by computing P^{-1}AP, where A= $\begin{bmatrix} 2 & 0 & -2 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$.

(b): By using the properties of determinants, find the rank of the given matrix,

$A = \begin{bmatrix} 5 & 3 & 2 & 1 \\ 3 & 2 & 1 & 4 \\ 4 & 1 & 7 & 6 \end{bmatrix}$.

Q.5. **(a)** Define the Gauss–Jordan elimination method and Solve the given system of equation by Gauss–Jordan elimination?

$$x_1 + 3x_2 - 2x_3 + 2x_5 = 0,$$
$$2x_1 + 6x_2 - 5x_3 - 2x_4 + 4x_5 - 3x_6 = 0,$$
$$5x_3 + 10x_4 + 15x_6 = 0,$$
$$2x_1 + 6x_2 + 8x_4 + 4x_5 + 18x_6 = 0.$$

(b): Show that $u = (-2, 3, 1, 4)$ and $v = (1, 2, 0, -1)$ are orthogonal vectors in R.
Let S = { i , j , k } be the set of standard unit vectors in R3, then show that each ordered pair of vectors in S is orthogonal.

Q.6. **(a)** Show that vectors u $u = 2x^3 - 3x^2 - 2x + 3, v = x^3 - 4x^2 - 3x + 4, w = x^3 + 5x^2 + x + 3$, are linearly independent?

(b): Find $\bar{A}$, $Re\ (A), Im\ (A), det\ (A), and\ tr\ (A)$ where A= $\begin{bmatrix} 4i & 2-3i \\ 2+3i & 1 \end{bmatrix}$.