University of Sargodha

BS 4th Term Examination 2017.

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. No. 1 Write short answers of the following in 2-3 lines each. (2*16)

(i) Define the subspace of a vector space?
(ii) What do you mean by Eigen vector and Eigen values?
(iii) Define the Fourier series?
(iv) What do you mean by the diagonal matrix?
(v) Define basis of a vector space?
(vi) Define linear equation by writing its standard form?
(vii) What do mean by the positive definite matrices?
(viii) Define a characteristic equation?
(ix) Define symmetric matrix by giving an example?
(x) Write the standard basis for R^3?
(xi) Define orthogonal vectors by giving a mathematical expression for orthogonality?
(xii) Define linear equation in xy-plane?
(xiii) What do you mean by the linear combination of a vector space?
(xiv) Define linearly independent vectors by giving an example?
(xv) Define dimension of vector space and subspace?
(xvi) Define Hermitian matrix by using the matrix given to check it to be Hermition or not?

$$\begin{bmatrix} 1 & i & 1+i \\ -i & -5 & 2-i \\ 1-i & 2+i & 3 \end{bmatrix}.$$

Subjective Part (3*16)

Q. No. 2: Find the characteristic equation, Eigen values and the corresponding Eigen vectors for the given matrix

$$\begin{bmatrix} 1 & -4 \\ 4 & 2 \end{bmatrix}.$$

(b): Write down the properties of the determinant.

Q. No. 3 (a): Solve for x;

$$\det\begin{bmatrix} 1 & 2+x & 3 \\ 2 & 1 & 3+x \\ 3 & 2+x & 1 \end{bmatrix} = 0$$

(b): Write the vector $v = (1,-2,5) \in \mathbf{R}^3$ as a linear combination of $v_1=(1,1,1)$, $_2 = (1,2,3)$, $v_3 = (2,-1,1)$.

Q. No. 4 (a): Find the rank of the matrix

$$\begin{bmatrix} 2 & 1 & 3 & 5 \\ 15 & 8 & 1 & 12 \\ 11 & 5 & 8 & 6 \\ 12 & 8 & 7 & 10 \end{bmatrix}.$$

(b): Find the inverse of the given matrix by cofactor method.

$$\begin{bmatrix} 1 & 2 & -1 \\ 0 & -1 & 3 \\ 1 & 0 & 2 \end{bmatrix}.$$

Q. No. 5: Find the solution of the following system of linear equations by using Gauss-Jordan method;

$$\begin{aligned} 2x_1-x_2-x_3 &= 4, \\ 3x_1+4x_2-2x_3 &= 11, \\ 3x_1-2x_2+4x_3 &= 11. \end{aligned}$$

Q. No. 6: Let

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 2 & 0 \\ 3 & 1 & 5 \end{bmatrix}$$

Examine whether A is invertible and, if so, then find out determinant of A^{-1}.
