University of Sargodha

BS 4th Term Examination 2016

Subject: Software Engineering **Paper: Linear Algebra (Math: 3215)**

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

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

Objective Part (Compulsory)

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

i. Solve the augmented matrix which is reduced to row echelon form $\begin{bmatrix} 1 & -3 & 4 & 7 \\ 0 & 1 & 2 & 2 \\ 0 & 0 & 1 & 5 \end{bmatrix}$

ii. Define transpose of a matrix.

iii. Express the matrix equation as a system of linear equation $\begin{bmatrix} 5 & 6 & -7 \\ -1 & -2 & 3 \\ 0 & 4 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \\ 3 \end{bmatrix}$

iv. Solve the matrix equation for a,b,c and d $\begin{bmatrix} 3 & a \\ 1 & a+b \end{bmatrix} = \begin{bmatrix} b & c-2d \\ c+2d & 0 \end{bmatrix}$

v. What is an invertible matrix?

vi. Prove that $(AB)^{-1} = B^{-1}A^{-1}$

vii. Let A be the matrix $\begin{bmatrix} 2 & 0 \\ 4 & 1 \end{bmatrix}$ find P(A) where $P(x) = x^3 - 2x + 4$.

viii. Is given matrix symmetric? $\begin{bmatrix} 2 & 3a & 0 \\ 3a & 1 & b \\ 0 & b & 0 \end{bmatrix}$

ix. Find λ for the matrix $A = \begin{bmatrix} \lambda - 4 & 4 & 0 \\ -1 & \lambda & 0 \\ 0 & 0 & \lambda - 5 \end{bmatrix}$ with $|A| = 0$

x. Evaluate the determinant $\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 2 & 2 & 2 \\ 0 & 0 & 3 & 3 \\ 0 & 0 & 0 & 4 \end{bmatrix}$

xi. Find a non-zero vector u with terminal point P (-1,3,-5) such that u has the same direction as v = (6,7,-3)

xii. Find the angle between u and v, $u = (2,0,1,-2)$; $v = (1,5,-3,2)$.

xiii. Determine whether A is invertible or not if $A = \begin{bmatrix} 2 & 0 & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 3 \end{bmatrix}$

xiv. If $u = (5, -1, 2)$, find norm of u.

xv. What is L-U decomposition

xvi. Define symmetric matrix

Subjective Part (4*12)

Q.2. Solve the linear system of equation by Guass- Jordan elimination.

$x_1 + 2x_2 - 3x_3 = 6$
$2x_1 - x_2 + 4x_3 = 1$
$x_1 - x_2 + x_3 = 3$

Q.3. Determine the values of '*a*' for which the system has non- solution, exactly one solution and infinitely many solution.

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

Q.4. Find all the minors and cofactors of given matrix

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

Q.5. Find Eigen values and Eigen vectors of the following matrix

$A = \begin{bmatrix} 3 & 0 \\ 8 & -1 \end{bmatrix}$

Q.6. Find LU- decomposition of $A = \begin{bmatrix} 4 & 4 & 0 \\ 8 & 6 & 2 \\ -4 & -10 & 8 \end{bmatrix}$

Q.7. For what values of λ is the set $[t+3, 2t + \lambda^2 + 2]$ linear independent