National University of Computer and Emerging Sciences, Lahore Campus

Course:	Linear Algebra	Course Code:	MT104
Program:	BS(Computer Science)	Semester:	Fall 2016
Duration:	60 Minutes	Total Marks:	30
Paper Date:	14-11-2016	Weight	15%
Section:	ALL	Page(s):	1
Exam:	Midterm-2	Roll No:	

Instruction/Notes: Show complete calculation.

Question 1: (5 marks)

Consider the set W of all vectors in $\mathbb{R}^4$ of the form (a, b, c, d) where $a = b + c$ and $d = a + 1$. Is W a subspace in $\mathbb{R}^4$?

Question 2:

Suppose you are designing a simple video game where the player controls a shooter to hit moving targets. If the shooter is an arrowhead whose vertices at any point is in the span of column vectors of A where

$$A = \begin{bmatrix} 1 & 2 & 3 & 2 & 1 \\ 3 & 1 & -5 & -2 & 1 \\ 7 & 9 & 13 & 2 & 5 \end{bmatrix}$$

a) **(6 marks)** Determine the basis for the column space of A.
b) **(4 marks)** Find the rank and nullity of A.

Question 3: (15 marks) Determine whether A can be diagonalized. If yes, then find the matrix P that diagonalizes A and find $P^{-1}AP$.

$$A = \begin{bmatrix} 2 & 0 & 0 \\ 1 & 2 & 1 \\ -1 & 0 & 1 \end{bmatrix}$$