



**MNS Department**  
**Semester: Fall 2017**  
**Course Title: Linear Algebra and Fourier Analysis (Mathematics IV)**  
**Course No: MAT 216 (Section: 06)**

**Time: 1 hour**  
**Total Marks: 40**

**Date: October 24, 2017**

Answer any FOUR:

- ✓ 1. Let  $T: R^4 \rightarrow R^3$  be the linear transformation defined by: [10]  
 $T(x, y, z, t) = (x - y + z + t, x + 2z - t, x + y + 3z - 3t)$ .  
Find a basis and dimension of Range(T) and Kernel(T).
- ✓ 2. Solve  $A\underline{x} = \underline{b}$  using  $A^{-1}$  for the following system of equations: [10]  
$$\begin{aligned} x + y + z &= 5 \\ x + y - 4z &= 10 \\ -4x + y + z &= 0 \end{aligned}$$
- ✓ 3. Find  $P(A)$  for  $A = \begin{bmatrix} 4 & -1 \\ 0 & 2 \end{bmatrix}$  and  $P(x) = x^3 - 3x^2 + 2x - 1$ . Also find [10]  
 $(BA^T - 2C)^T$ .
- ✓ 4. Determine whether the set  $\{(1, 1, 2), (1, -1, 2), (1, 0, 1)\}$  forms a basis [10]  
for  $R^3$ .
- ✓ 5. Find a basis for the row space, column space and null space of: [10]  
$$A = \begin{bmatrix} 1 & -2 & 0 & 0 & 3 \\ 2 & -5 & -3 & -2 & 6 \\ 0 & 5 & 15 & 10 & 0 \\ 2 & 6 & 18 & 8 & 6 \end{bmatrix}$$
  
Also find rank and nullity.