Matrix theory Assignment 11

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***Abstract*—This document explains the concept of vector space over a binary field**

Download all python codes from

https://github.com/saipranavkr/EE5609/codes

and latex-tikz codes from

https://github.com/saipranavkr/EE5609

1 Problem

Let V be a vector space over the field $F = \{0, 1\}$. Suppose α, β and γ are linearly independent vectors in V. Comment on $(\alpha + \beta)$, $(\beta + \gamma)$ and $(\gamma + \alpha)$

2 Solution

The addition of elements in the field **F** is defined as,

$$\begin{aligned} 0 + 0 &= 0 \\ 1 + 1 &= 0 \end{aligned} \tag{2.0.1}$$

A set are vectors $\{\mathbf{v_1}, \mathbf{v_2}, \mathbf{v_3}\}$ are linearly independent if

$$a\mathbf{v_1} + b\mathbf{v_2} + c\mathbf{v_3} = 0 \tag{2.0.2}$$

has only one trivial solution

$$a = b = c = 0 \tag{2.0.3}$$

Now taking $a = b = c = 1$,

$$\begin{aligned} 1(\alpha + \beta) + 1(\beta + \gamma) + 1(\gamma + \alpha) &= \\ (1 + 1)\alpha + (1 + 1)\beta + (1 + 1)\gamma &= \\ 0 + 0 + 0 &= 0 \end{aligned} \tag{2.0.4}$$

From (2.0.4) it can be shown that $(\alpha + \beta)$, $(\beta + \gamma)$ and $(\gamma + \alpha)$ are linearly dependent