EE4013 ASSIGNMENT- 1

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Download all codes from

```
https://github.com/AbdurNawaz/EE3025/tree/main/
    Assignment−1/codes
```

And Latex-tikz codes from -

```
https://github.com/AbdurNawaz/EE3025/tree/main/
    Assignment−1/
```

1 Problem

Consider a matrix $\mathbf{P}$ whose only eigenvectors are the multiples of $\begin{bmatrix}1\\4\end{bmatrix}$.

Consider the following satements.

(i) $\mathbf{P}$ does not have an inverse.
(ii) $\mathbf{P}$ has a repeated eigenvalue.
(iii) $\mathbf{P}$ cannot be diagonalized.

Which of the following options is correct?

(A) only (i) and (iii) are necessarily true.
(B) only (ii) is necessarily true.
(C) only (i) and (ii) are necessarily true.
(D) only (ii) and (iii) are necessarily true.

2 Solution

We can observe that all the eigenvectors are linearly dependent.

Following are the properties/theorms that we will use,

1) Eigenvectors from different eigenvalues are linearly independent.
2) An n x n matrix is diagonalizable iff there are n linearly independent eigenvectors.

Sinice all the eigenvectors are linearly dependent, using property (1) we conclude that $\mathbf{P}$ has repeated eigenvalues.

Using property (2) we can conclude that $\mathbf{P}$ cannot be diagonalized.

Hence (D) is the right answer.

2.1 *Codes and References*

We implement Gaussian elimination to find the rank of the matrix(stack of all eigenvectors) to check if all the eigenvectors are linearly dependent.

Code implementation to check linear dependency of eigenvectors-

```
https://github.com/AbdurNawaz/EE3025/tree/main/
    Assignment−1/codes/compute_rank.c
```