

Matrix Theory: Assignment 7

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Abstract—This document is to find the trace of a matrix.

equals the trace of the matrix, hence, the trace of \mathbf{A}^{20} is:

Download all latex-tikz codes from

https://github.com/Debolena/EE5609/blob/master/Assignment_7/latex_file.tex

$$tr = 2^{20} + 2^{20} + 3^{20} \quad (2.0.6)$$

$$= 2 \cdot 2^{20} + 3^{20} \quad (2.0.7)$$

Therefore, option 3 is the required answer.

1 PROBLEM

The trace of a matrix

$$\begin{pmatrix} 2 & 1 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}^{20} \quad (1.0.1)$$

is

- 1) 7^{20}
- 2) $2^{20} + 3^{20}$
- 3) $2 \cdot 2^{20} + 3^{20}$
- 4) $2^{20} + 3^{20} + 1$

2 SOLUTION

Let,

$$\mathbf{A} = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix} \quad (2.0.1)$$

To find the eigen values of \mathbf{A} :

$$|\mathbf{A} - \lambda \mathbf{I}| = 0 \quad (2.0.2)$$

$$\Rightarrow \begin{vmatrix} 2 - \lambda & 1 & 0 \\ 0 & 2 - \lambda & 0 \\ 0 & 0 & 3 - \lambda \end{vmatrix} = 0 \quad (2.0.3)$$

$$\Rightarrow (2 - \lambda)(2 - \lambda)(3 - \lambda) = 0 \quad (2.0.4)$$

$$\Rightarrow \lambda = 2, 2, 3 \quad (2.0.5)$$

Eigen values of \mathbf{A} are 2,2,3.

Hence, the eigen values of \mathbf{A}^{20} are: 2^{20} , 2^{20} and 3^{20} respectively.

As we know that the sum of eigen values of a matrix