

**Department of Electrical and Computer Engineering**  
**Fall 2023 COMPREHENSIVE/BREADTH EXAM**

TTG Area: Power Systems

Linear Algebra

Part I

Consider matrix A with Pascal's Triangle:

$$A = \begin{bmatrix} 01 & 01 & 01 & 01 & 01 & 01 & 01 \\ 01 & 02 & 03 & 04 & 05 & 06 & 07 \\ 01 & 03 & 06 & 10 & 15 & 21 & 28 \\ 01 & 04 & 10 & 20 & 35 & 56 & 84 \\ 01 & 05 & 15 & 35 & 70 & 126 & 210 \\ 01 & 06 & 21 & 56 & 126 & 252 & 462 \\ 01 & 07 & 28 & 84 & 210 & 462 & 924 \end{bmatrix}$$

Determine  $\det A$ .

Part II

Consider matrix A:

$$A = \begin{bmatrix} 01 & 01 & 01 & 01 & 01 & 01 & 01 \\ 01 & 02 & 03 & 04 & 05 & 06 & 07 \\ 01 & 03 & 06 & 10 & 15 & 21 & 28 \\ 01 & 04 & 10 & 20 & 35 & 56 & 84 \\ 01 & 05 & 15 & 35 & 70 & 126 & 210 \\ 01 & 06 & 21 & 56 & 126 & 252 & 462 \\ 01 & 07 & 28 & 84 & 210 & 462 & 923 \end{bmatrix}$$

Determine  $\det A$ .