APPLICATION OF LATTICE ORDERED RINGS IN ENUMERATION OF MULTIPLICATIVE BASES OF MATRICES

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ABSTRACT. In a finite-dimensional algebra over a field $\mathbf{F}$, a basis $\mathbf{B}$ is called *a multiplicative basis* provided that $\mathbf{B} \cup \{0\}$ forms a semigroup under multiplication. We will describe all multiplicative bases of $\mathbf{F}_n$, the full algebra of $n \times n$ matrices over a subfield $\mathbf{F}$ of the real numbers. Every such basis is associated with a nonsingular zero-one matrix via a lattice order on $\mathbf{F}_n$. This correspondence yields an enumeration method for nonequivalent multiplicative bases of $\mathbf{F}_n$.

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