Step-1

Let $\mathbf{C}^n$ be the complex vector space. It contains n independent unit coordinate vectors. Therefore, dimension of complex vector space $\mathbf{C}^n$ is n.

Simple basis of $\mathbf{C}^n$ will be n independent unit coordinate vectors. These vectors are not real.

$$(i,0,0,\ldots,0),(0,i,0,\ldots,0),\ldots(0,0,0,\ldots,i)$$

Step-2

Therefore, nonreal basis for $\mathbf{C}^n$ are: $\boxed{(i,0,0,\ldots,0),(0,i,0,\ldots,0),\ldots(0,0,0,\ldots,i)}$