We first make a general observation on the semiprime ideals in a right artinian ring R. Say A $\subseteq R$ is semiprime. Then rad $R \subseteq$ A since rad R is nilpotent. On the other hand, if A is any ideal containing rad R, then A/rad R must be the sum of some simple components of the semisimple ring R/rad R. But then R/A is semisimple and hence A is automatically semiprime. On the other hand, for such A to be prime, we need A/rad R to be the sum of all but one simple components of R/rad R. To apply this to the ring R in the exercise, recall that rad R is the ideal of R consisting of matrices with zero diagonal, and R/rad $R \sim k \times k \times k$. In particular, the prime (or maximal) ideals of R are:

$$\begin{pmatrix} 0 & k & k \\ 0 & k & k \\ 0 & 0 & k \end{pmatrix}, \begin{pmatrix} k & k & k \\ 0 & 0 & k \\ 0 & 0 & k \end{pmatrix}, \begin{pmatrix} k & k & k \\ 0 & k & k \\ 0 & 0 & 0 \end{pmatrix}$$

There are only five more semiprime ideals in R, namely:

$$\begin{pmatrix} 0 & k & k \\ 0 & 0 & k \\ 0 & 0 & 0 \end{pmatrix}, \begin{pmatrix} k & k & k \\ 0 & 0 & k \\ 0 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & k & k \\ 0 & k & k \\ 0 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & k & k \\ 0 & 0 & k \\ 0 & 0 & k \end{pmatrix}, \text{ and } R.$$