**Problem 2.59** (Solution by Dongning Guo, June 20, 2001)

Let the autocorrelation function of $s(t)$ be

$$R_s(\tau) = \int_{-\infty}^{\infty} s(t)s(t+\tau)dt. \quad (1)$$

The matrices $R[0]$ and $R[1]$ are defined by

$$R_{jk}[0] = \begin{cases} 
1, & \text{if } j = k; \\
\rho_{jk}, & \text{if } j < k; \\
\rho_{kj}, & \text{if } j > k;
\end{cases} \quad (2)$$

$$R_{jk}[0] = \begin{cases} 
0, & \text{if } j \geq k; \\
\rho_{kj}, & \text{if } j < k,
\end{cases} \quad (3)$$

where for $j < k$,

$$\rho_{jk} = \int_{-\infty}^{\infty} s_j(t)s_k(t)dt \quad (4)$$

$$= \int_{\frac{j-1}{K}T}^{T + \frac{j-1}{K}T} s(t - \frac{j-1}{K}T)s(t - \frac{k-1}{K}T)dt \quad (5)$$

$$= R_s(\frac{j-k}{K}T) \quad (6)$$

and similarly

$$\rho_{kj} = \int_{-\infty}^{\infty} s_j(t-T)s_k(t)dt \quad (7)$$

$$= \int_{T + \frac{k-1}{K}T}^{T + \frac{j-1}{K}T} s(t - T - \frac{j-1}{K}T)s(t - \frac{k-1}{K}T)dt \quad (8)$$

$$= R_s(T - \frac{k-j}{K}T). \quad (9)$$