APPENDIX A

THE ORTHONORMAL POLYNOMIALS RELATED TO THE EIGENVALUE DENSITY

In this appendix we give the expression for the orthonormal polynomials defined in eq.(2.2-2) of chapter II, for any arbitrary order ν. It is given by

$$[D_\nu D_{\nu-1}]^{1/2} P_\nu(x) = \begin{vmatrix} 1 & M_1 & M_2 & M_3 & \dots & M_\nu \\ M_1 & M_2 & M_3 & \dots\dots & & M_{\nu+1} \\ \dots\dots & & & \dots\dots & & . \\ M_{\nu-1} & \dots & & . & & M_{2\nu-1} \\ 1 & x & x^2 & \dots\dots & & x^\nu \end{vmatrix} \qquad \text{(A-1)}$$

where D_ν is the determinant with the last row replaced by $[M_\nu, M_{\nu+1}, \dots, M_{2\nu}]$. The number of polynomials is the same as the dimension of the space. When the density is Gaussian, i.e.

$$\rho(x) = (2\pi\sigma^2)^{-1/2} \exp\left[-\frac{1}{2}\left(\frac{x-\varepsilon}{\sigma}\right)^2\right] \qquad \text{(A-2)}$$

the polynomials $P_\mu(x)$ are related to the Hermite polynomials $H_{e\mu}$ by

$$P_\mu(x) = (\mu!)^{-1/2} H_\mu\left[\frac{x-\varepsilon}{\sigma}\right] \qquad \text{(A-3)}$$

where $H_{e\mu}(x) = 2^{-\mu/2} H_\mu(x/\sqrt{2})$

When the density is of Chi-squared type, the $P_\mu(x)$ are related to the Laguerre polynommials.