Appendix A

Definition *The Kronecker product of* $A = [a_{ij}] \in M_{m,n}(F)$ *and* $B = [b_{ij}] \in M_{p,q}(F)$ *is denoted by* $A \otimes B$ *and is defined to be the block matrix*

$$A \otimes B = \begin{bmatrix} a_{11}B & \cdots & a_{1n}B \\ \vdots & \ddots & \vdots \\ a_{m1}B & \cdots & a_{mn}B \end{bmatrix} \in M_{mp,nq}(F).$$

We also mention another Kronecker operation, the Kronecker sum, $A \oplus B$ is defined by square matrices A and B and is given by

$$A \oplus B \stackrel{\triangle}{=} A \otimes I_m + I_n \otimes B,$$

where $A \in M_n$ and $B \in M_m$. Thus, $A \otimes I_m$, $I_n \otimes B$, and their sum are in M_{mn}.