6.7 Verifying 6.17:

For $k(\mathbf{x}, \mathbf{x'}) = k_1(\mathbf{x}, \mathbf{x'}) + k_2(\mathbf{x}, \mathbf{x'})$, the Gram matrix $\mathbf{K}$ corresponding to kernel function k becomes:

$$\mathbf{K} = \mathbf{K}_1 + \mathbf{K}_2$$

Since the sum of positive semidefinite matrices is positive semidefinite, $\mathbf{K}$ is positive semidefinite and the kernel function k is valid.

Verifying 6.18:

For the kernel function $k(\mathbf{x}, \mathbf{x'}) = k_1(\mathbf{x}, \mathbf{x'})k_2(\mathbf{x}, \mathbf{x'})$, the Gram matrix $\mathbf{K}$ corresponding to kernel function k becomes:

$$\mathbf{K} = \mathbf{K}_1 \circ \mathbf{K}_2$$

where $\circ$ represents the Hadamard product.

As per the Schur product theorem, the Hadamard product of two positive definite matrices is also a positive definite matrix. So, $\mathbf{K}$ is also positive semidefinite and the kernel function k is valid.