3.4(a)The autocorrelation function $r(k) = \sum_{n=0}^{\infty} x(n)x^*(n+k) \quad , \ (k \geq 0)$.

$$Z\{r(k)\} = \sum_{k=-\infty}^{\infty} r(k)z^{-k} = \sum_{k=0}^{\infty}\left(\sum_{n=0}^{\infty} x(n)x^*(n+k)\right)z^{-k} =$$

$$\sum_{n=0}^{\infty}\left(\sum_{k=0}^{\infty} x(n)x^*(n+k)z^{-k}\right) = \sum_{n=0}^{\infty} x(n)\left(\sum_{k=0}^{\infty} x^*(n+k)z^{-k}\right)$$

$$= \sum_{n=0}^{\infty} x(n)z^{n}[X^*(z^*)] = X\left(\frac{1}{z}\right)X^*(z^*)$$

(b) The convolution $y(n) = \sum_{n=0}^{\infty} h(k)x(n-k)$.

$$Z\{y(n)\} = \sum_{n=-\infty}^{\infty} y(n)z^{-n} = \sum_{n=0}^{\infty}\left(\sum_{k=0}^{\infty} h(k)x(n-k)\right)z^{-n}$$

$$= \sum_{k=0}^{\infty} h(k)\left(\sum_{n=0}^{\infty} x(n-k)z^{-n}\right)$$

$$= \sum_{k=0}^{\infty} h(k)[z^{-k}X(z)] = X(z)H(z)$$