We know that

$$y = T(x) \tag{1}$$

$$x = T^{-1}(y) \tag{2}$$

$$p_Y(y) = p_X(T^{-1}(y))|\frac{d}{dy}T^{-1}(y)| \tag{3}$$

$$p_Y(y) = \frac{k}{l} * (\frac{y}{l})^{k-1} * e^{-(\frac{y}{l}^k)} \tag{4}$$

$$P_Y(y) = 1 - e^{-(\frac{y}{l})^k} \tag{5}$$

Combining (3) and (5) we have

$$1 - e^{-(\frac{y}{l})^k} = \int_0^y p_X(T^{-1}(z)) \left| \frac{d}{dz} T^{-1}(z) \right| dz \tag{6}$$

Applying integration by substitution

$$1 - e^{-(\frac{y}{l})^k} = \int_0^{T^{-1}(y)} p_X(z) dz \tag{7}$$

Using (1) and (2)

$$1 - e^{-(\frac{T(x)}{l})^k} = \int_0^x p_X(z) dz \tag{8}$$

We approximate probability distribution with normalized histogram

$$\int_0^x p_X(z) dz \approx \tilde{H} \tag{9}$$

Which means that if N - number of pixels in the image

$$e^{-(\frac{T(x)}{l})^k} = 1 - \frac{H(x)}{N} \tag{10}$$

Take logarithm of both sides

$$-\left(\frac{T(x)}{l}\right)^k = ln\left(1 - \frac{H(x)}{N}\right) \tag{11}$$

Multipy both sides by $-l^k$

$$T(x)^k = ln\left(1 - \frac{H(x)}{N}\right) * -l^k \tag{12}$$

And finally take both sides to the power of $1/k$

$$T(x) = \left\lfloor \left(\left| ln\left(1 - \frac{H(x)}{N}\right)\right|\right)^{\frac{1}{k}} * l \right\rfloor \tag{13}$$