Q1. Calculate the normalized correlation coefficient between the following one-dimensional signal windows [34, 44, 49, 50, 37] and [31, 26, 22, 20, 34].

Q2. Given that [1, 2, 9, 9, 8, 1, 1] and [1, 1, 2, 1, 1, 3, 8, 8, 5, 1, 1, 1] are template and search windows of a one-dimensional pattern.

Compute

- Normalized correlation coefficient for all possible positions of template window.
- A continuous correlation function (2nd order polynomial) in the neighborhood of the largest correlation coefficient.
- Location of the maximum of the formed correlation function.

Q3. Given the following two subarrays from a pair of digital images, compute the normalized correlation coefficient.

$$A = \begin{bmatrix} 49 & 50 & 48 \\ 53 & 66 & 71 \\ 55 & 68 & 72 \end{bmatrix} \qquad B = \begin{bmatrix} 52 & 40 & 45 \\ 67 & 57 & 79 \\ 42 & 73 & 87 \end{bmatrix}$$

Q4. The array C is a template and S is a search array in a digital image containing the template.

$$C = \begin{bmatrix} 40 & 50 & 40 \\ 50 & 50 & 50 \\ 40 & 50 & 40 \end{bmatrix} \qquad S = \begin{bmatrix} 44 & 45 & 50 & 64 & 46 & 43 \\ 43 & 44 & 48 & 63 & 49 & 45 \\ 45 & 46 & 50 & 65 & 48 & 45 \\ 62 & 62 & 64 & 70 & 64 & 63 \\ 48 & 48 & 50 & 68 & 55 & 51 \\ 41 & 44 & 48 & 63 & 42 & 47 \end{bmatrix}$$

Compute

- Normalized correlation coefficient for all possible positions of template window.
- A continuous correlation function (2nd order polynomial) in the neighborhood of the largest correlation coefficient.
- Location of the maximum of the formed correlation function.

Q5. Give comments regarding each of the following items:

- Location and size of the search window.
- Optimum size of the reference window.
- Matching threshold.
- Cases in which correlation matching might fail.
- Influence of epipolar geometry on matching process.